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# NORTHWEST GEM TRAILS

*A Field Guide for the Gem Hunter, the Mineral Collector and the Tourist*

*By*

***H. C. DAKE***

**Includes**

**OREGON • WASHINGTON • IDAHO**
**MONTANA • WYOMING**

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**OREGON — WASHINGTON — IDAHO — MONTANA and WYOMING**

*By*

**H. C. DAKE**

*Editor* THE MINERALOGIST MAGAZINE

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# Foreword

THE CHIEF AIM of this little volume is to present information for those who are interested in collecting gems and minerals, in the field as a hobby. For many years there has been a wide demand for a field guide of this kind. Many thousands of residents in the Pacific Northwest, spend some of their leisure time, and vacations in the field, collecting gem materials and minerals, primarily as a recreational activity. Thousands of visitors from more distant points, also visit this great playground of the Pacific Northwest.

It is not the purpose of this guide to present information to enable the casual visitor to garner in great quantities of valuable rough gem materials, and fine minerals. On the contrary, an extended vacation field tour, calculated in dollars and cents cost, will likely not prove profitable. The hobbyist, and the home gem cutter are not primarily interested in a profitable field trip or vacation tour from a pecuniary standpoint. The cost of a tour is charged to recreation, and any fine and valuable materials gathered are regarded as so much additional profit and good fortune.

While at times field tours do provide a large quantity of fine and valuable materials, suitable for gem cutting or specimens, this is not the general rule. It is true that often time and energy spent digging at some gem locality will yield a good quantity of valuable material. One fortunate gem hunter may dig for a few days, and strike a pocket producing thousands of dollars worth of superb material. An adjacent digger, less fortunate, may work equally hard, and produce very little. But in all cases they seldom leave empty handed.

A newly discovered locality, in the Western states, usually yields the discoverer a good quantity of fine material. This is often material that has weathered out through the centuries, and is found resting on the surface. The surface material seldom lasts long, and those who come later are generally obliged to dig in order to win the rough gems.

Many of the localities described here have been personally visited by the writer, during the past 25 years. Some of these areas have been described in back issues of *The Mineralogist Magazine,* since 1933. Many of these old issues are no longer available, hence some of this data is reprinted here. The localities described here are not the sole work of the writer. Since 1933, a great many subscribers to *The Mineralogist Magazine* have kindly given us information for the benefit of others, and credit for same is given in the text.

It may be noted that some localities are described in considerable detail, while in other instances the data is less specific and more vague. This is to be expected, and where the information is partly lacking, local inquiry is indicated. Local residents, when properly approached are generally willing to give information. Filling stations which you may patronize may also be helpful, as the attendants are usually familiar with the local region.

Obviously, locality information is not always easy to obtain, for many reasons that will appear clear to anyone. Greedy persons, or those who travel in huge trucks, are likely to deplete a good locality promptly of all surface material. Localities where digging is indicated are, of course, likely to produce much longer. In some cases, especially out in the wide open spaces of the Western states, it is not always possible to present detailed directions to enable the visitor to instantly reach the exact spot. Out over the sage covered regions, and similar areas off the beaten track, landmarks, and highway signs are usually lacking. The directions given here are presented as accurately and as detailed as possible, but the individual will be expected to use some personal initiative in locating the exact areas.

This little guide book does not pretend or guarantee that the reader will find all places described, or that if a specific area is visited, that the gem hunter will be amply rewarded. Past experience in describing localities has proven that the majority will reach the place, and not leave empty handed—while a small minority not familiar with travel in these regions may entirely miss the place described. We may or may not be blamed and criticized.

While a great number of localities have been discovered in the states described here, there remain even more that await discovery. Twenty years ago when there was little popular interest in gem cutting as a hobby there were few gem hunters in the field, and comparatively few localities were known. During the past decade there has been a tremendous increase in those who are interested in gem cutting as an avocation. And through the activity of these persons, thousands of new localities have been brought to light in the Western states. True, many older localities have been depleted, but hundreds of new ones have been discovered during the past decade.

There are millions and millions of acres in the great Public Domain of the Western states. Here the gem hunter may roam at will, dig, and gather material with no restrictions whatsoever. Upon this great Public Domain many new localities have been found, and still more await discovery. It seems needless to call attention to the fact that private property is generally surrounded by a fence — in the Western states it is usually a barb wire fence. The Public Domain is not fenced. Those who are brash enough to barge into fenced land, cut wire fences, tear down gates, will likely find themselves in more or less difficulties — if the land owner happens to be in the vicinity.

Only in rare cases will permission be denied those who seek permission from the land owner. And where this is refused, or where signs are posted, there is always a good and sufficient reason for same. But even in these limited instances, it is often possible to gain entry by proper approach and technic. It is likely that as time goes on, more and more private property will be posted against entry or trespass. Many of these postings are primarily aimed at the flesh hunter armed with a shotgun or high powered firearm, and not the gem hunter armed with pick and hammer. As a general rule when your business is made known to the property owner, you will be made welcome in the true Western fashion, and no one would dream of taking advantage of or violating this courtesy.

If you wish to spend a vacation in the field on an extended tour, it is suggested that you plan your tour in advance and with specific routes and localities on schedule. An aimless wandering over the region will likely yield very little, and not enhance the recreational value of the journey. In addition to the information provided here, there are other sources of helpful data. Various books, including *Quartz Family Minerals,* will provide additional information pertinent to localities, and their general geology and mineralogy. Many of the state mining bureaus have bulletins of a helpful nature, and while these are not intended primarily for the gem hunter or mineral collector, they are usually of value in field work.

In visiting a new and strange region, local collectors can be of great help, as they are usually quite familiar with the surrounding terrain. Often it is possible to get acquainted with a local collector by the correspondence route, or perchance at one of the regional federation gatherings. Friends of this kind usually enable you to better enjoy a tour, and locating a locality much more readily. The various journals in this field also publish locality data at frequent intervals. The journals will also enable you to visit supply houses en route, as practically all supply firms, and individuals who sell carry advertisements in one or more of the magazines devoted to your hobby. The silver pick will always enable you to return home with fine material, regardless of your luck in the field.

It may be just as well not to attempt to visit too many localities in a limited time. A hurried or superficial visit to a locality will seldom be worthwhile. After all, the specimens generally have to be searched for, dug out, gleaned from some waste dump at an old mine, or perhaps won from the hard rock matrix in a quarry. A visitor may read of some locality and after a visit will complain "there is nothing there". This is usually not correct. The stranger has failed to find the best spots, or has failed to spend enough time in diligent search, or for many other reasons. Many of the superb specimens we see from some noted locality were collected by persons who had perhaps visited the region dozens of times. It is better to spend a full day at one locality than a few hours at several places. Remember, when you are sitting at the wheel of the car, bowling along at 50 per, the scenery may be excellent, but the trunk is not being filled. Do not be too hasty to blame the writer of a locality, or feel that he has first cleaned out the locality, and then passed along the information in the form of an empty sack. This is seldom the case. Likely the writer did obtain all the fine material claimed, but failed to state how many hours or days were devoted to their acquisition.

For the benefit of the inexperienced, we may add a few words regarding collecting conditions in various parts of the country. In general, there are two types of localities, one where the material is found in its original place of birth, and the other where it has been weathered out and found as detrimental material.

We will only refer here to a few type localities; a detailed description would entail separate treatment, and we will leave this task to some other writer.

The pegmatites of the New England states and South Dakota are excellent sources of a great variety of fine minerals, 100 or more species have been described from these formations. Obviously, collecting in an intact pegmatite presents a formidable task for hand labor. Usually collecting is carried out in pegmatites which are operated on a commercial scale for certain minerals. The waste material is cast aside or on dumps, and these are eagerly gleaned by collectors.

Rock, limestone and various other types of quarries are plentiful throughout the Atlantic states. Often "pockets" are encountered in quarrying, and these pockets may contain mineral crystals—often superb zeolites. As long as the quarry is in active operation specimens are likely to be forthcoming, and these commercial operations remain under the eagle eye of local collectors.

The locality of Clay Center, Ohio, is known to collectors far and wide for its remarkable fluorite and celestite. All Clay Center specimens come from an enormous limestone quarry, a hole in the ground about the size and shape of Meteorite Crater of Arizona. One could spend days and days in the Clay Center quarry and yet not cover the entire terrain. Tools are needed here.

The river gravels throughout the United States are good sources of specimens, usually hard-water worn material. Since the high waters each year work over the river gravels we may expect a new crop each year. The noted moss agate from Montana is derived from the gravels of the Yellowstone River. The gravel bars can be reached and searched to best advantage during the summer low water.

Here are localities which will never be depleted. The Rio Grande River, up and down stream for over 50 miles from Laredo, Texas, has yielded great quantities of good specimens, mainly water-worn quartz family minerals. Obviously we would not expect to find soft or fragile minerals among the river gravels. Gold is the soft exception to the rule.

Let us go down to Florida and observe the collectors at work at Ballast Point, Tampa Bay. Here the collector wears rubber boots, carries a small crow bar, and generally a pair of heavy leather gloves. Coral, which has been petrified with beautifully colored chalcedony and agate, may often be obtained in large masses or fantastic forms. The specimens are broken off from their attachments in shallow water and at low tide. Collecting has been carried on here for years, and yet the supply does not appear to have been greatly diminished.

We can cross the country and nearly all along the Pacific Ocean beaches fine agates and other quartz minerals may be found in the gravel bars along the beach, with best collecting at low tide. In Oregon a good gravel bar may be suddenly covered by sand or exposed by a storm or change in tides or wind. A gravel bar may remain "sanded" for years and then suddenly be exposed, to the good fortune of the first comers. So if you visit along the Pacific Ocean beaches, do not be surprised to see numerous persons walking slowly along the beach with heads bowed down. They are not in silent meditation—merely gem seekers.

It is true that there are great areas in the Mid-West that hold little interest for the collector. Much of this region is level prairie country. However, there are some good collecting grounds here. The "strip" (open cuts) coal mines near Wilmington, Illinois, produce some of the most beautiful fossil flora to be found anywhere. Collectors glean the waste dumps of the stripped surface material in search of the elongated concretions. When split open lengthwise these frequently reveal the imprint of some leaf or plant that thrived millions of years ago.

At numerous places in the Mid-West there are huge gravel deposits carried down from the far North by the Pleistocene glaciers. Here one may expect to find almost any mineral which can survive water wear, including even native copper carried down from northern Michigan. Colorful quartz minerals and fossil wood is common to these gravels. Some of these gravel deposits are worked in a commercial manner, which serves to ease the labors of the collector.

Throughout the western half of the United States there are large mining regions which offer excellent possibilities. At many mines it is customary to throw the waste or lean material removed from the mine workings on huge dumps. Since this is waste material there are generally no restrictions on collecting. Mining states like Colorado, Arizona, New Mexico, California, Utah, Nevada, Idaho, Washington, Oregon, and others, boast of thousands of these "dumps" ranging in size from the small dump of the prospect pit, to those containing hundreds of thousands of cubic yards of waste material.

Often these dumps contain material of interest and value as specimens. Some of these dumps represent material which may have been removed from the mine 50 to 75 years ago, still waiting for the collector. Several years ago the writer spent four successive summer vacations at the old mining camp of Silver City Idaho, some 50 miles from Boise. Here large and small waste dumps dot the hillsides by the thousands. If every collector (trucks included) spent an entire summer at this locality, they could no more than scratch the surface of these dumps. Here is a locality that can never be depleted.

These old and sleeping mining camps offer not only excellent collecting possibilities but they are often off the beaten path, high up in the mountains, and an excellent place to spend a few weeks away from the rush of the city and the busy highway traffic.

Some fine material may be obtained from old mine dumps. In the early days of mining when fabulously rich ore was encountered, it was customary to carelessly cast away valuable ores. The operators were waxing rich, and often the miners were careless. Some of these old mine dumps have long since been reworked and run through the maw of the crushers in the mills, but a very large number, not large enough, or not conveniently situated, still remain intact.

Collecting on a mine dump often requires no more equipment than the cleaving hammer. It is easy and pleasant to sit at the foot of a dump and rake down and sort over the debris for specimens. In the dump of an old silver property, it is not at all uncommon to retrieve a fine rich silver specimen originally overlooked or cast aside through carelessness. Then the beautiful crystals of the gangue minerals, and the zone of oxidation minerals, are always present. Your entire vacation can be spent with pleasure and profit at one of these old mining camps.

Depending on where you collect you will require an assortment of tools and packing material and containers. Working in hard rock, chisels and hammers are indicated. If you visit one of the sage-covered desert localities of the west, you will want a heavy pick and shovel, as when surface material is lacking, digging may be indicated.

If you expect to collect fine crystals and similar fragile material take along packing material and suitable containers. Massive or water-worn material can be safely cast into a burlap sack and dumped in the car. In all cases take along a supply of labels, and is each container place the proper label. Your memory may prove faulty when you return home. You will, of course, always have your prospector's pick handy; this is your most universal single piece of equipment.

In the following pages we will not devote ourselves exclusively to gem minerals. Often at a gem locality, fine crystals or mineral specimens may be available, and there will be no objection to adding some of these to the accumulation of rough gems. In practically every collection of gem stones and polished specimens, we invariably see at least a few fine, and outstanding crystal groups, which serve to round out and dress up any type of collection.

The novice at gem hunting will likely not be enabled to readily recognize good material when it is seen in the rough in the field. This is a matter that requires a little experience, to enable ready "on sight" recognition of suitable gem cutting material. The novice is just as likely as not to cast away valued pieces and return with almost worthless material. In some cases it is difficult for even the more experienced to recognize a good specimen, especially where the exterior is water worn and drab in color. Usually chipping off a small corner of a specimen will suffice to reveal its true quality, on the freshly broken surface. Or it may even be necessary to saw off a section to view the interior, as is the case with all intact thunder eggs, nodules, and the like.

In order to gain a good working knowledge in the proper recognition and appraisal of rough gem material, the novice will do well to view the specimens in advanced collections. Or typical material of specific value and quality may be purchased from supply firms, in order to enable the novice to separate the sheep from the goats, as it were.

A great many of the supply firms in various parts of the country are largely dependent upon the field worker to replenish their supply of rough gems, minerals fossils, and geological specimens. The hobbyist collector will invariably obtain more or less duplicate material, and if this is of suitable commercial quality it may be readily disposed of in quantity to supply firms. Many home gem cutters manage to make the hobby pay its way through disposal of surplus material finished in their home shops. This income frequently suffices to pay for wheels, saws, and other necessary supplies. Poor quality material is in little demand, it is quite common, and often hardly worth the cost of lapidary treatment. It costs no more to apply lapidary treatment to good quality material than it does to inferior junk. In selling to a supply firm, retail prices are not to be expected, the dealer must meet the cost of handling, selling, advertising, and realize a profit in the transaction. Few other hobbies hold comparable possibilities and versatility.

—H. C. Dake
February 1950

# Oregon

## The Agate State

The gem bearing regions of Oregon may be divided into two main areas, the western part of the state, and the central and eastern portion, divided by the Cascade mountains, extending north and south across Oregon. In gem production, the central part of Oregon is by far the most important, comprising one of the best gem regions in the United States.

## WESTERN OREGON

The main gem areas of the western part of the state are the Pacific Ocean beach gravels, the stream gravels and the elevated regions of southwestern Oregon.

The Willamette and Clackamas rivers, two dominant streams in western Oregon, have yielded limited amounts of gem materials. These are mainly quartz family minerals, with agates comprising a major portion. Search is generally made in the gravel bars along these streams and their tributaries during low water period in late summer. Fine agates, including superb sagenite types are available, but a considerable quantity of the water worn gravels are common rock, hence considerable search must be made to win the gem pieces. Water worn masses of agatized woods may also be encountered.

In Douglas County, the various tributaries of the Umpqua river have produced many fine gem materials, including agate, iris agate, moss agate, plasma, jasper, bloodstone, and carnelian. Perhaps the most notable gem production is the grossularite garnet from the upper reaches of the North Umpqua river. Huge water worn boulders of this garnet have been found here. The material occurs in various colors, but mainly of a drab dull color, not suited for lapidary treatment, but most excellent for carvings, and large ornaments. Some of the masses collected weigh upwards of 200 pounds. This garnet has often been termed Oregon "jade". It does closely resemble nephrite jade in general physical appearance.

Jackson County is noted for its fine agates especially the colorful "moss" varieties, and many tons of this material have been gathered. The extensive deposits of black moss agate (similar to the well known Montana moss agate of the Yellowstone River), begin four miles north of Central Point, and extend to the Rogue River and eastward for 15 miles. Eagle Point is in the center. So much collecting has been done on what is called the "desert" pasture land between Central Point and Eagle Point, that choice moss agates are scarce. Plowed lands still furnish good material.

Agate nodules, white to pale blue, quartz crystal geodes, and quartz crystals, occur on the Ashland - Klamath Falls highway (No. 66), half way up Greensprings Mountain, and still higher up are moss carnelian agates.

On the heights above McLeod (highway No. 62 Crater Lake), quartz crystals are found. The region around McLeod also produces some of the most superb and spectacular compact masses of acicular radiating crystals 6 to 8 inches in length. Local lapidarists sometimes saw or grind down a surface on the natrolite, for polishing which often enhances the specimen for cabinet purposes.

A variety of green and white jasper, locally termed "medfordite," is found at Big Butte. A bloodstone variety of jasper occurs at Big Falls.

Mining activities are conspicuous in Josephine County, and while visiting this region the collector will have ample opportunity to obtain minerals other than those of the quartz family. Among other rare items are the water worn pebbles of josephinite found in the gravels of Josephine Creek, and the Illinois River.

Cove Creek produces geodes. An orbicular variety of jasper termed "oregonite" locally is mined at a locality north of Holland, a privately owned property.

### Eagle Point Locality

The noted locality of Eagle Point, Oregon, is some 10 miles north and east of Medford, near the Crater Lake Highway. Fine gem quality agate has been collected here for many years, including superb carnelian varieties of scenic moss agate. During the war the Army took over several square miles of the best agate-bearing region, and collecting came to a standstill. Medford is situated on U. S. Highway 99.

Most of the military reservation is now open to the public, and collectors may again visit this noted region. Agates of the Eagle Point country are scattered over a wide area, they are found among the alluvial gravels which cover the greater part of this region. The best time for collecting is during or following a rain when the specimens become wet, and may be more readily noted. The best collecting spots are in the gullies and washes, where the agates have been exposed. Most of the area is covered with grass and moss, but fine agates also rest on or near the surface.

A prospector's pick or stout rake are handy for scratching the surface to expose the gem pieces. The agate of Eagle Point are of two main types, the vein agate, with alternating layers of clear agate, and nearly opaque while chalcedony. In the vein type material, the "pictures" will be noted at the contact between the chalcedony and agate, and sawing is required to expose the gem portions. The second type is clear agate, with scenic moss pictures of many kinds. Nearly all the Eagle Point agate is slightly carnelian in color. This color is usually only near the surface, and seldom penetrates deeply. It is thought that the cause of the carnelian color is due to the presence of iron salts or iron oxides (originally colorless), which are altered to ferrous and/or ferric iron oxides, to bring about the carnelian colors. This alteration is probably due to long exposure of the agate to the heat and ultraviolet light of the sun. It is known that many colorless agates carrying small percentages of certain forms of iron, may be altered to carnelian and sardonyx colors, by the well-known heat treatment.

Most of the fine gem agates found at Eagle Point are not large in size, they average upwards to about 3 or 4 inches in size as the maximum. Many of the agates found here are wholly devoid of any markings, they are just plain agate with a good tint of carnelian color. However, among these duds some very fine gem specimens are to be found. Under favorable conditions, hundreds of agates may be gathered here in a day's collecting but likely only a small portion will show good markings, and perhaps one in a hundred will be super fine, and often of good value.

Rhodonite, a mineral classed as a semi-precious gem and frequently used in the cheaper class of jewelry, derives its name from the Greek word rhodon, "a rose," because of its beautiful rose-pink hue.

Rhodonite occurs in southern Oregon at two main localities, Evans Creek and Cave Creek. The best quality in the state is found in the region about the Oregon Caves, where it can be obtained in fairly large masses. Along some of the streams in Josephine and Jackson counties are found some fine water-worn "pink agates," which usually prove to be rhodonite. These stones, having found their way to the streams and being intermingled with agates, are often confused with them.

### Table Rock

Some excellent gem cutting material is available in the region around Table Rock Mountain, some 12 miles north of Medford, Oregon. The localities described here are near good highways and can be readily reached.

The small streams coming down from the north side of Table Rock Mountain are productive of good petrified woods, well suited for lapidary treatment, and of good colors. The fossil wood specimens are found mixed in with the stream gravels. Possibly prospecting up the sides of Table Rock would locate the source of this material.

In this same region on Butte Creek, near Eagle Point, fine colored moss agate is available. The best material appears to be found at the point where Butte Creek and Antelope Creek join, and from there on down stream. The colored moss agate is excellent for cabochon cutting, and is found among the stream gravels. Collectors who have recently visited these localities report no difficulty in obtaining an abundance of good material.

### Althouse Creek

Miss Venitia Daley of Medford, Oregon, has given us the following description of the little known locality of Althouse Creek.

At the foot of the Siskiyou Mountains, in the Althouse Creek bed, in Josephine County, Southwestern Oregon, jade-like water worn boulders were found a few years ago. These unique masses of garnet variety grossularite have also been described from the Rogue and Upper Umpqua rivers of Oregon, where they occur in practically all the colors of true jadeite and nephrite.

In the gravels of Althouse Creek masses of this jade-like garnet measuring up to 18 inches in diameter have been found by local collectors. This variety of garnet resembles jade closely in every physical appearance. The specific gravity of the material is high, hence in the field it can easily be distinguished from quartz and other minerals, by hand "hefting"—it is about twice as heavy as common rock, jasper, or agate. Locally, the garnet is known as "Oregon jade" or beeswax jade."

Along with the garnet, various other gem materials are found, including good red jasper, greenstones, serpentine, and agate. Althouse Creek is the ghost-town site of early gold-mining activities. It was known and worked as early as 1853, in the days of the gold rush to this region. The placers of Althouse Creek were worked at intervals over a period of some 60 years, including Chinese miners in 1870. In more recent years modern dredges have gone over much of the gold-bearing alluvials.

Althouse Creek is readily accessible in the summer by auto. Leave the Redwood Highway at Oregon Caves Junction, and drive to the town of Holland. Take dirt road to right of store and continue for a mile and a half to its end. You are then in the center of Althouse Creek bed. The huge piles of tailings from the old dredging operations may be prospected with profit.

### Bloodstone Locality

A new locality that yields some good specimens of bloodstone and green and red plasma of cutting quality is reported by Reverend M. T. Wire of Ashland, Oregon. The locality is one half mile beyond Brownsboro, Jackson County, Oregon, where a side road turns to left from main highway, just before crossing a small bridge. Follow side road for 300 yards to a small wooden bridge, over a small stream bed. The bloodstone material occurs in the stream bed, which is dry in the summer months. Excellent material has been found in the gravels and debris of the creek.

### Petrified Wood

Petrified wood is common to many localities in the western states, but silicified or agatized wood showing the borings of worms is not at all common, and has been reported from comparatively few localities. Some years past, Jack Whartos of Roseburg, Oregon, found a number of huge masses of petrified wood, almost completely riddled with borings of teredo worms. He describes here one of the huge masses found.

The specimen in question is a solid and fully silicified mass, somewhat circular in shape and weighing over 500 pounds. It was taken from the bed of the North Umpqua river, twenty miles east of Roseburg, Oregon. From field evidence it appeared likely that the material was resting in its original matrix consisting of loosely consolidated sandstone, where silicification originally took place. Evidently these sandstones were once the bottom of the ocean or at least the arm of an inland sea, for various types of marine concretions and shells are found in the standstones enclosing the wood specimen. Teredo or wood boring worms are found only in salt water seas.

The grain of the original wood and the teredo holes stand out clearly over the greater part of the specimen. The wood is of a nearly black color due to a small percentage of residual carbon, while the worm holes are of a lighter gray color, making them stand out in clear contrast and appear to have been filled with mud and sand prior to silicification. Some of the worm holes show a border of calcareous material which may be a remnant of the former inhabitant.

The wood takes an excellent polish and is free of fractures common to some types of silicified or jasperized woods. In the same sandstones nearby a few concretions carrying worm-eaten petrified wood have been found, but there is no record of so large a mass having been found at this locality previously.

A few small specimens of this type of wood have been previously found at other localities in southwestern Oregon and one has been reported from a Lincoln County beach.

### Sweethome Forest

The most notable petrified forest area in western Oregon, is the region around the little community of Sweethome. This petrified forest, for a number of reasons, stands unique among the many petrified forests in the world. A brief description is given here.

The Sweethome Petrified Forest is readily accessible by auto and is situated some 25 miles southeast of Albany, Oregon, and can be reached via highway number 99. The forest is named after the town of Sweethome. The best exposures of the fossil wood are to the south of this community.

A preliminary survey made of the area by local collectors, including Walter Nelson, Charles Flory, George Kirkwood, and the writer, indicates that the fossil forest extends over an area of *at least twenty square miles.* The localities which have so far yielded the best and most abundant specimens are on the small farms between the towns of Sweethome and Holley. The latter town is about 4 miles south of Sweethome. Fossil wood is also found over a considerable area to the south and east of the above communities.

The region is traversed by the Calapooya river, the principal drainage basin. Practically all the creek and river gravels are likely to yield specimens, but the best examples are found along the sides of stream beds and encountered in plowed fields.

The geological horizon at which the fossil wood occurs in the Sweethome Petrified Forest appears to be associated with the Tyee standstones which are referred to as Eocene age. This would place the age of the fossil wood at approximately 50 million years. Further studies of the region may prove a correlation with the well known Goshen flora to the South in Lane County, which would place the Sweethome Forest in Oligocene.

Outcroppings of fossil flora were encountered in the Sweethome Forest region, but no detailed study has been made of this material. The ancient Sweethome Forest probably thrived under sub-tropical climatic conditions, as indicated by specimens of fossil fig wood which have been found. Cedar, laurel and oak have also been identified, but hardwoods are not dominant.

For some years the farmers in this region have looked upon the specimens of fossil wood as an annoyance. While plowing the fields innumerable specimens of petrified wood are encountered on some of the farms, and these, together with what rock the plow may expose, are piled along the fences or thrown upon huge piles. Some of the farms have small mountains of rock intermingled with fossil wood. In many instances permission can be readily obtained to remove this "rock" from the property. The region is not thickly settled, but around most of the farms in the Sweethome district fossil wood is abundant, and generally a small pile of the better grade of specimens will be seen around the homes.

Ames Creek, south of Sweethome, appears to yield a tremendous quantity of specimens. As a matter of fact, at least ten per cent of the rock in the creek bottom and along the shores is fossil wood. On a farm of 150 acres which Ames Creek passes through over *two tons* of limb sections were picked up in a very limited area.

Not all specimens of fossil wood found in the Sweethome Petrified Forest are colorful and suitable for cutting and polishing. Perhaps only above five per cent of the specimens can be classed as outstanding. Rather, the locality is remarkable for the fact that a considerable amount of the wood is in well preserved complete limb and tree sections, which show the grain of the wood remarkably clear.

Most of the specimens are silicified and agatized, rather than opalized, hence bright colors are not found in profusion. A number of excellent jasperized specimens were seen by the writer. The complete limb and tree sections, regardless of color, make excellent specimens for study purposes.

Probably the most interesting and colorful of all specimens found in the Sweethome Forest is the wood which has been largely silicified by well colored carnelian agate. Usually these specimens are not complete replacements of the entire log section by carnelian, but show thick layers and seams of the agate running lengthwise with the grain of the wood. Some of these masses are of substantial size.

Although not occurring in any great quantity, very excellent carnelian agate is found associated with the wood at some localities in the Sweethome Forest, especially along Ames Creek. The agate masses are well colored and the color penetrates fairly deeply into the specimens. Some show combinations of fortification agate with the carnelian color.

Many of the tree and limb sections of fossil wood found in the Sweethome Forest will range from three to eight inches in diameter, and in varying lengths up to several feet. Some smaller and considerably larger (see illustrations) sections are also available.

After a number of trips to the locality by the writer and others it was thought that no trees standing in the original vertical positions were to be found. Local residents had stated that in certain places stumps were standing in vertical position. After some search an area was found by Charles Flory and the writer where marvelously agatized specimens existed.

The denuded fossil trees found standing in the vertical position are approximately 50 million years in age and are remarkable in that they are standing in the midst of a present-day Douglas fir forest no more than 200 years old. In many instances a five-foot diameter fossil stump may be seen adjacent to a 200-year-old fir, pine or oak tree. The present forest is a mixed one, with Douglas fir in the dominant position.

The area of vertical standing stumps is not an isolated one, but extends over a considerable area. In the thickest part of the present-day forest the debris is so deep that the old agatized remains can not readily be found, but upon slopes where small streams have cut canyons the fossil examples are well exposed. In one area of only a few acres over *twenty* large stumps were noted standing in vertical position. Scattered about in this area are many tons of large and small petrified logs and a great amount of fragmentary material.

About four miles from the above described area of standing fossil trees is a remarkable exposure of the ancient forest in a cross section. This locality is in the canyon of the Calapooya River, about four miles east of Holley. Take the upper Calapooya road and park at the covered bridge and walk one-fourth mile down the railway track.

Exposed on the north side of the river canyon is a series of sedimentaries, including sandstone and consolidated clay shales. At numerous places on the face of the steep canyon wall can be seen petrified trees of various sizes standing in a vertical position. While colorful specimens are lacking here, the locality offers ample proof that the Sweethome Forest is not of the drift type, but was covered and fossilized while standing in the vertical position. It is hoped that these remarkable specimens will remain unmolested.

The typical dark and coarse sandstones in which the trees are embedded at this locality are exactly the same as those associated with the denuded standing forest described above. This sandstone also seems to mark the horizon at which specimens are most likely to be found. Above this specimens are not likely to be found, hence this outcropping of sandstone will serve as an excellent field guide to indicate where specimens occur.

Among other rare and unique specimens found in the Sweethome Petrified Forest is the silicified wood showing layers and coatings of quartz crystals. In some instances the quartz crystals are of a drusy nature, while specimens have been found showing quartz crystal groups of considerable size and comprising large specimens. The deposition of quartz crystals is in seams and layers and is probably of a secondary nature. The wood prior to silicification probably dessicated, the spaces caused by shrinkage were not filled in by the original deposition of silica, but by subsequent solutions of a different character.

### Nehalem River

A remarkably interesting and colorful mass of agate showing inclusions of marcasite, was found recently among the gravels of the Nehalem River, in Northwestern Oregon. The original mass was spherical in form from water wear and some six inches in diameter. A number of beautiful sections have been cut from the mass by Ray Schneider, the discoverer.

The marcasite is in the agate as an inclusion in the form of rosettes and flower-like growths. Marcasite is a mineral of low temperature deposition and forms only under these conditions, indicating that in this instance the agate was also deposited either from a silica gel or percolating waters under low temperatures. Marcasite is not a rare inclusion in agate and chalcedony, but seldom are superb specimens found.

The Nehalem River gravels yield a variety of other quartz minerals, including fine carnelian agate.

### Oregon Beach Localities

For many years the Pacific Ocean beaches have produced a wide variety of quartz gems, since these harder ones are about the only ones that can survive the rough treatment, of weathering from the local rock and the constant work of the surf, tides, and storms. Hence, as a general rule, the specimens found on the beaches are small, while in the central and eastern part of the state, huge masses may be encountered, essentially as they were weathered from the matrix.

Among the most sought for beach gems are the colorful and unique agates showing various acicular, and similar types of inclusions. These inclusions are growths of foreign mineral matter within the agate, and are refered to under the general name of "sagenite" variety agate. The collection of Mr. and Mrs. Charles McNeill of Willamina is as outstanding example of the possibilities in this variety of agate. Casts or pseudos of various forms of marine life are also available at many of the beaches. These are usually of agate, filling the mould left by a small marine clam or oyster. Frequently these agate casts contain movable bubbles of water (enhydros) making interesting and attractive cabinet specimens.

Well agatized fossil corals, and similar forms of marine life, may also be found in excellent specimens, some being suitable for lapidary treatment. In this group may be included fairly large masses of well agatized wood, showing marine worm hole borings. Most of these are not of lapidary quality, but make interesting and attractive specimens. Ocean storms bring almost every thing to the beaches, including huge hollow glass spheres, which drift across the Pacific Ocean from the fishing grounds around Japan. The best agate beaches are those of Lincoln County.

Of the many types of agate found in Oregon and other Pacific coast states the "cloud" agates found at Lincoln County, Oregon, beaches are perhaps as rare in good specimens as any of the other varieties.

The "cloud" agates, which occur sparingly at the Lincoln county localities, are found in the sands of the beaches, as water-worn pebbles in sizes up to several inches. The "cloud" effect appears to be caused by inclusions of organic matter of a dark color, against a matrix of nearly colorless agate, lending a strong resemblance to storm clouds in the sky. Many of these specimens have been utilized for cabochon cutting as well as being cut and polished for cabinet specimens.

This type of agate is not at all plentiful and is eagerly sought for by the beach agate hunters. So far as can be learned the "cloud" agates found at the above locality are equal to the best found anywhere.

The beaches in the vicinity of Yachats have without doubt produced the finest and most valuable types of agate found at any of the Oregon beach localities. These are the well known sagenite types. At Yachats a rather large number have been found during the past 20 years, some being of fairly large size up to five inches or more in diameter, but most of them only about two inches in average diameter.

These remarkably fine sagenites are exposed from time to time, generally following a heavy storm, when no more may appear for many months. Viewed on the exterior, these rounded, water worn agates may appear just like a common rock, some experience and skill is required to pick them from among the waste debris. At times perhaps only an isolated specimen may be picked up, but again a whole "pocket" may be found in a small area, following a storm. This type of agate is generally cut into thin slabs, polished on both sides, to make magnificent and valuable transparencies. Single large size rough boulders have cut hundreds of dollars worth of slabs, and single finished slabs have brought upwards of fifty dollars each.

For the benefit of those who may wish to visit the Oregon gem beaches, E. S. Bateman of Seattle, Washington, describes a typical tour of the northern portion of the Oregon beach localities.

Such a great variety of cutting material of great beauty and gem quality, from the beaches of Oregon's West Coast, had been seen, admired, and some of it worked up by the writer that a deep urge was developed to go there and gather as much as luck and fast hustling would permit within a limited time.

The takeoff was in March, reported to be an ideal time for finding high grade agates, jaspers, jasp-agates, sagenite, etc.

One reason why early March was recommended to the writer was that winter conditions as to storms, uncovering gravel bars on beaches, etc., would be practically duplicated, but under conditions much milder and more comfortable to this agate seeker's tender hide. This was very important, as even with protection from bad weather, such as souwester hat, especially water-proofed, oil treated army slicker reached down to midcalf, and with hip boots with heavy double six, it was found to be "Just Tough," and hard to take.

The old "Agate Special," made fairly fast time going south on U. S. Highway No. 99, until the Longview Bridge across the Columbia was reached, Crossed, and the rather tortuous Oregon State Highway No. 30 running to Astoria was entered.

Winding along the Oregon hillsides, an unrivaled scenic drive of entrancing beauty, thru heavily wooded country unrolled, with frequent glimpses of the mighty Columbia, with cultivated farms and small communities laying on its bottom lands.

A large and prosperous city, Astoria is indeed well worth anyone's time to stop and look over its many and varied enterprises, Naval installations, and scenic attractions. But, the writer was after agates, and no town could offer sufficient counter attractions to cause a pause in the trip.

So, passing out of beautiful Astoria along splendid paved highway, now changed from Highway No. 30 to Highway No. 101, west and southwesterly across the base of the peninsula, the first clear open view of the mighty Pacific with its limitless horizon, and boundless immensity. Huge combers rolling in upon the beaches in endless succession, gave life and motion to the grandeur of the great ocean, that always impresses the writer beyond words to describe it. How puny and weak man really is, with all of the products of his brain children, when confronted by the stupendous forces of nature functioning with ease, power, and machine like regularity, fascinating to watch.

Arriving at Seaside, the old terminus of the original Lewis and Clark trail of the old days, the writer was surprised to note the large number of people seen there. This beautifully situated and well kept resort was supposed to be for summer use, but the winter population was very numerous. Large schools were a good indication that many families make it their permanent home the year round.

Dropping down from over the hill into the old town of Nehalem, where the Nehalem River meets the salty tides of the Pacific, reminded the writer of the famous olden days, and the intensely interesting dramas enacted in real life, by real people. All revolving around pirates, buried treasure, Indian tribes, and their conflicts, and treasure seekers who came each succeeding generation to try and wrest the pirate treasure from its resting place, right down to the present time.

Legend records the landing of the pirates' boats on the beaches, the carrying of chests up to the hill, near where the town of Manzanita now stands, all taking place before Oregon became a territory, and while the British had delusions about grabbing all of the vast body of land bordering on the Pacific and north to the then nebulous Canadian line.

How the pirates compelled their black slaves to bury the supposed chests containing the treasure. How they killed all but one who plunged into the thick forest and escaped.

The sailing away of the pirates never to return.

The return later of the escaped slave with several white men from a trading post on the Columbia River. Their diligent search for the treasure and failure to find it.

The white man seen in a canoe at a later date coming down the Nehalem River with the canoe deeply loaded with treasure. His passing out into the Pacific, and never being heard from again.

All as witnessed by the tribe of Indians living there, and by them recounted from father to son, or daughter, down to present times.

And, even as late as the month of May 1946, how Seattle, Bremerton, and Oregon men, are seeking the same treasure with modern equipment, such as wartime mine detectors, and bull dozer. Seeking in vain if the opinion of one man who has made a lifetime study of legend, and the probable course of events, that probably took place, is correct.

As Highway No. 101 winds along the coast, the traveler is within sight and sound of the beaches practically all of the way, with but few digressions inland, and as it passed thru town after town, the "Agate Special" finally reached Yachats, and a comfortable cabin, where dinner was quickly prepared, after splitting and carrying in the wood for cooking and heating, followed by relaxation and quickly to sleep, lulled by the steady song of the nearby breakers on the beach.

The writer got a big kick out of rustling stove wood from the wet wood pile. And, even tho years of electric kitchen, and oil-burning furnaces, had somewhat dulled his technique, managed to get along fine, even tho the wood was so wet that it was necessary to use oil in promoting a hot fire.

Up and away early the next morning to the beach most highly recommended by an experienced collector, beach raker friend, distant 11 miles south of Yachats at "Big Creek." A very pleasant and instructive interview with property owner Mrs. Stonefield in her fine home overlooking the beach and ocean, was productive of a genial affirmative, when permission was requested to hunt for agates.

The writer believes, and every fresh experience lends confirmation, that if rock hounds would always contact owners for the permission to enter their premises, and to leave locked gates, and unlocked gates just as they find them. Few refusals would be met with and very often helpful suggestions would greatly help the finding of fine material, and add to the all around pleasure of the hunt.

Parked the "Agate Special" just south of the bridge over Big Creek on the inside or near the bank, and well out of the way of passing traffic, donned souwester long army slicker, hip boots, and slung canvas sack with pick in it over shoulder, and easing down bank close to bridge, passed across short stretch of meadow, and slid feet first down the bank onto the beach, with the muttered remark to myself "Agates, here we come."

A quick look see, disclosed a strata of gravel along the high bank of the creek, extending from beneath the water up about 5 feet. Estimating that this deposit was the probable source of the agate material washed out onto the bar by the creek waters, some time was spent in careful examination of the face. Evidence of recent activities by predecessors, and nothing interesting being found, soon caused a shift to the long wide gravel bar at the creek mouth. This huge bar extends from the mouth of Big Creek out beyond low tide, and for long distances both ways along the beach.

Cruising slowly back and forth, many fine red, green, and black plain jaspers, and the variegated type combining all of the plain colors, were quickly popped into the sack. Some very fine jasp-agate in pleasing combinations was added to the sack. There was a great deal of the ordinary or colorless, to colorless with white bandings present, but, only that was taken which promised interesting bandings when worked up into cabs, was picked up.

Large amounts of material was passed up, as the writer is a firm believer in high grading as you go, carrying only the best away.

Good pickins were found both north, and southwards to the California line, and beyond, according to information given. Much to the writer's chagrin not a fragment of sagenite was found, but no need to feel too disappointed, as no luck was experienced by about 20 other pebble gazers, most of them ladies, who wandered around in the wind and rain, soaked to the skin, and looking like nothing so much as a flock of water-soaked hens, running here and there, as first one, then another, emitted shrill cries over some colorless agate material, that more experience would have taught them was not worth taking with them. These earnest rock seekers and their men friends with them, certainly deserved more success than they had, braving such weather. One of the men casting around presented an interesting angle in beginner agate hunting, as he wove back and forth along the beach, head down to the wind driven rain, eyes on the gravel. He suddenly angled over to a split rock weighing about 150 pounds, rolled the halves around a bit, studying hard all the while, then started away shaking his head, and in passing made the remark "I wish I knew good stuff when I see it."

The writer then examined the boulder, finding it to be a beautiful seal brown quartz, precciated and resealed with a material almost black in color, the rock not being hard enough to qualify as gem material.

One very interesting viewpoint on the effect of absolute concentration, and singleness of purpose in agate hunting, was presented to the writer at a later date by a very distinguished member of our Seattle Gem Collectors Club, at the last meeting for the summer. Colonel J. F. Murbach hearing our plaintive remark about not finding Sagenite, explained very forcibly, "You have got to look for sagenite, and nothing else. Forget other agates, and concentrate on the sagenite, and you will find it, because it is surely there, you just don't recognize it. I was down there at Big Creek with a party, and not being able at the time to cover the beach like our young folks were doing, was taking it easy in the car. Upon hearing the same complaint that you make, I went out a short distance on the beach, concentrated on sagenite and found these (exhibiting several beautiful sagenite slabs), so you try it that way next time and you will have better success."

One is told many stories where Lady Luck played a part in the experiences of agate hunters, such as that of a local boy who casually picked up a dull uninteresting looking rock, chipped a corner off and found that he had a 9 pound sagenite, that netted him $100.00 in Portland.

Another heartbreaker goes like this. A number of pebble gazers were cruising along a beach near Agate Beach just 3 miles north of Newport, casting back and forth industriously. Two men approached each other, one of them passing ahead and kicking at a dull protruding rock, most of it buried in the gravel, but passing on without further investigation. The other rock hound following directly behind, more experienced than the first man, halted, calling out to the man ahead, "Hey, brother! Take another look at this one."

The first man swung quickly back, started excavating in great haste, and finally unearthed a huge sagenite, the largest and finest ever found on any Oregon beach. This gem netted the finder $1,500 cash from a well known collector in Portland. The reaction of the other well meaning agate seeker can be better imagined than described. The writer believes that there are reasonable limits in the friendly competition of agate hunting, in giving the other fellow all the breaks. The least that the lucky agate hound could have done was to have seen to it that the one whose friendly act made it possible for him to reap such a rich reward so cheaply, shared in some degree at least, in the payoff. There was no record that any such thing had been done in this case.

Blissfully unaware of the extent and degree, that the urge to hunt agates had upon the regulars living along the coast, the writer assumed that bad weather would cause most of them to stay off the beaches, but, if there is any day in the 365, that someone is not prowling the beaches, personal observation while there, and diligent inquiry, failed to uncover it.

Actually the never ending search goes on every daylight hour, and one would not be surprised to see some enthusiast poking around the gravel bars, with gas lantern or flashlight, at any hour of the night.

Evidently the agate business, ie; finding, cutting, polishing, mounting and selling is one of the money producers of the local residents.

While commercialized, all of those in the game are uniformly courteous, and helpful to a genuine rock hound, thereby sustaining and perpetuating the well known traditions of the rock gathering fraternity. The professionals were once all amateurs.

This fine attitude is assured to all if the agate hunter uses his head, and good common sense, by contacting owners where available for permission to enter upon their property! closes gates, or leaves them open if found open, and in other words leaves everything as found, or in better condition than when found, etc.

Another important condition was brought out more clearly, ie; that the covering with sand, and uncovering of the gravel bars goes on each tide, to a greater or less degree, and that the only sure way to be lucky, is to be there, "Johnny on the bar," as the tide goes out.

Having accumulated a goodly share of booty, the writer packed up early one morning and hit the trail for home, with the idea to go straight thru, non-stop. But, alas, and alark, it is impossible for an agate enthusiast to pass an agate shop and not stop. There were few if any of the agate emporiums on the highway that were passed up. And if any there were, it was indeed unintentional, and because they were not visible to the fast moving traveler on wheels.

With all windows close, the "Agate Special" waited for a favorable time, then dashed thru sheets of falling water, coming out with a badly needed free car wash, and bowled along merrily towards the next stop, which was Agate Beach, as the writer simply could not prevent his foot from braking to a stop in front of the fine little lapidary shop, entitled, Picks Agate Shop, where a first class example that the agate business is fast becoming an important industry, is to be seen. Pleasant Mrs. Sarah Law conducted the writer thru their beautiful sales room, where a bewildering profusion of choicest gems were seen, and in the rear or factory part, where he was much impressed by its compact, orderly efficiency. Skilled craftsmen and women, many of them trained here, were turning out agate jewelry for the wholesale trade in a production line keeping 7 people busy, and we were informed, steadily employed.

The broad front of Currier's Lapidary and Curio Shop was the next magnet to draw the writer and a very pleasant half hour chat was had with a real old-timer on Oregon's West Coast. He knew the answers on finding material, both on the beaches and all points inland, from many years hunting. He has seen beaches uncovered and recovered, from tide to tide, where virgin pickings were available to the agate seeker happening to be on the spot, but, many times driving him away by a quick change in the tide before a satisfactory amount can be bagged. He recalls that Famous Agate Beach, south of Taft, has not been fully uncovered in 15 years, and its treasures are practically intact.

Some 15 years ago, the unexpected happened. A large area of gravel was left clear of sand by the receding tide during a big storm, exposing an agate seekers' bonanza. An untouched flat beach studded with all of the varieties found there. All he had to do was to high grade as he went along, to his heart's content, only the finest were picked up. Working fast as he gathered all the choice material that he could carry (and he is a big man), off a square rod of gravel bar before the swiftly returning tide drove him away, and resealed the treasure trove with sand many feet deep. What a wonderful set up to thrill and haunt an agate hound's dreams. And, the fascinating idea about it is, that it can happen again, during any storm, all the way from Agate Beach to below the California line on beaches known, and unknown as agate producing. No wonder agate hounds and placer gold miners never are the same again after one initial success where Lady Luck smiles. However, one has to be "Johnny on the bar," when it happens, and that is where the local agate chasers have the edge. But, the writer believes that if Lady Luck rides your shoulder, anyone has the chance to strike it rich.

Here is a prospecting trip that will never grow dull, or monotonous. Infinite scenic beauty in bewildering variety, interesting people to meet, splendid auto camps, numerous beaches to try one's luck, with the assurance that the rewards of industrious hunting are certain for the agate hound, makes sure the writer's determination to go back again, as soon as possible.

## Southern Beaches

The beaches of the southern Oregon coast are not so well known, but have yielded a variety of good material. D. F. DeVoe of the Gold Beach Mineral Shop, at Gold Beach, Oregon, tells us something of the collecting possibilities in this region.

People outside of Oregon are finding out what residents along the coast have long known, that collecting among the beach gravels of the Pacific is not only a great deal of fun, but is productive of gemstones of the highest quality. The collecting here is not as good as it was year ago, but unlike most localities the beaches will never be depleted. A new supply of material is constantly being washed down the streams, or eroded out or uncovered on the beaches.

Conditions vary from beach to beach, but in most cases the best collecting is in the winter time, November to April, when the storms have washed away the sand, leaving the gravels exposed. I have collected on most of the localities mentioned here, and the following information on the whole is as accurate as it is possible to get in view of the constantly changing conditions, typical of beach localities.

Brookings, near the Oregon - California line, has a very beautiful rugged coastline, but the collecting here is as a rule, very poor. A certain amount of grossularite garnet is found here, especially the valued pink variety, but there is little else of value. The coast north of Brookings to Sebastian is, on the most part, isolated and hard to reach, and the sections I have managed to explore were poor collecting grounds.

From Cape Sebastian north to Hunters Creek is fair collecting in the winter, especially in the first mile or so south of Hunters Creek. This is a long open beach, and the gravel occurs in piles at irregular intervals. A fair sample of the gem material found from Gold Beach to Newport will be found here, but in much less profusion.

Perhaps here is as good a time as any to describe the materials found on the Southern Oregon Coast. To my mind the most unusual is the grossularite garnet, found from the California State line to the Umpqua River. This material is described by Dr. H. C. Dake in "The Gem Minerals of Oregon," and closely resembles jade in practically all respects. I have found it in the gravels of the Rogue River and Hunters Creek, and large masses are said to be found in the upper reaches of the Umpqua River. Agate is found in practically all its varieties, and often in profusion. Twice I have found large clear agates too big to budge from their sandy beds and of course far too heavy to pack off the beach. There is an infinite variety of jaspers, often in huge masses, and coming in all colors and patterns. I have found at least a dozen varieties of orbicular jasper, and seen another dozen varieties picked up by other collectors, ranging from white to brilliant green. Sagenite is found all along the coast, but by far the best locality for this material is Yachats. And of course, fossil woods of various types. There is also petrified bone, a occasional agatized shell, and a multitude of odd and unusual things that are found occasionally.

There is a long stretch of beach directly in front of Gold Beach and there is usually gravel on parts of it any time of year. However, this is another place where the collecting is only fair. This stretch of beach ends at the Rogue River. Incidently, the north bank of the Rogue from the mouth to the bridge was a fine collecting ground ten years ago, but a series of floods in 1939 and 1940 washed out the gem bearing gravels.

Just four miles north of the Rogue River is a cove called Agate Beach, and this place and the series of small coves that extend two miles north from it are by far the best collecting places in this section. I have collected gems here for ten years, and the local mineral society members are on the hunt here most of the time. Quantities of fine material are found here all year, the best being the winter, of course. Often certain types of gem material will concentrate for a short time in certain spots, and if you are lucky to be there at the right time, you may load up with garnet, or fossil wood of some type, or some particular color or type of jasper.

Seven miles north of Gold Beach is Nisika Beach. This stretch is about three miles long, and extends to Ophir. As a rule there is no gravel on this stretch, but occasionally in the winter a few piles of gravel will be uncovered. These usually come and go between tides, and the local residents are the only ones handy enough to these short lived spots.

Rocky point is three miles south of Port Orford, and is the southern end of the Port Orford beach. There is gravel on this beach only occasionally in the winter, and often as I have tried, I have never been able to catch this beach in a generous mood. When there is collecting here, is is supposed to be very good indeed, and is one beach where a fine variety of agatized coral is found. There is also another little cove directly behind Port Orford called Agate Beach. There is usually nothing bigger than pea gravel there, but it can be very good too. If you think agate collecting is a new thing, I can show you a card announcing the sixth annual Agate Carnival at Port Orford in 1916.

Between Port Orford and Cape Blanco (U. S. most westerly point) are miles of open beaches. From what the old timers tell me, this used to be the best of all collecting beaches years ago. Gravel seldom shows here now, possibly some change in the offshore currents, the weather, or even the Russians caused the change. But whatever the cause, there is no more gravel to be found here, or at least when I or my friends visit this locality, and we have tried often, and will keep trying. I hear that a very attractive amethyst agate is found along here. North of Cape Blanco is another area that is very tough indeed to reach, but there is a couple of coves in there that look like they might have possibilities. But the only way to get in there in the winter is with a jeep.

From this section clear north to the Yachats area there is little to tempt the collector, with the possible exception of around Bandon, which is like the Cape Blanco beach, it was good years ago. Saki Beach, north of Bandon is a place the Curry County Mineralogical Society has made several efforts to visit, but when the tides were right, the weather wasn't.

Yachats, of course, is famous for its sagenite. It is one of the best places of all to collect, not only for its fine material, but because most of the beaches are easily reached from highway. The highway skirts the ocean from China Creek right up to Yachats, and practically any place you see gravel you will find good collecting. I have had best luck at the mouths of the various creeks that empty into the ocean along here. In these spots the gravel is usually larger, and the larger the gravel the larger the specimens. In all this section, from Yachats to Newport you will find quantities of clear white beach agates, I've seen the beach almost glisten with them, and these are the stones that produce the well known enhydros, or water agates.

The collecting at Newport is always good when there is gravel on the beach. However, this section is prowled by many hundreds of collectors at all times of the year, and you need a quick eye.

Finally, the matter of clothing. Bring along plenty, beaches can be chilly in summer as well as winter. Boots are excellent any time of year, but especially in the winter, they not only allow you to wade the small creeks but help to keep feet warm. In the winter it is advisable to bring weatherproof clothing, we have lots of rain in this country, and it would be bad to have your collecting stopped by a little moisture from above.

## CENTRAL AND EASTERN OREGON

The great wide open spaces, and the sage covered deserts are in the central and eastern part of Oregon, and here we find some of the best agate gem localities in the world. Rhyolite and basalt are the dominant volcanic rocks in this portion of Oregon. The basalts are the dark, nearly black colored rocks, while the rhyolites are much lighter in color, and frequently weather to a dull reddish color. The rhyolites, including obsidian, and the perlite variety of obsidian, are volcanic rocks with a high silica content, and this is the home of the agate, and the agate filled thunder eggs, quartz crystal lined geodes, and agate nodules. It is generally futile to search the basalts for quartz family gems, but these rocks are the home of magnificent zeolites for those who are interested in this non-gem material.

The greater part of central, and much of eastern Oregon is comprised of rolling sage covered hills. Only in the higher elevations do we find timber, usually Pinus Ponderosa, or the familiar stunted growths of juniper. Nowhere is there dense underbrush. This makes the search for gems a comparatively easy task. All of the noted thunder eggs localities of Oregon were first discovered by a wandering gem hunter who by luck encountered an outcropping of "eggs". Usually when a new locality of this kind is found, it is possible to pick up many thousands of fine specimens from the surface, and still more will be covered with only a loose layer of surface debris. After this cream is skimmed off digging is indicated to reach the material more deeply covered with surface debris.

Thunder eggs are perhaps the most unique and colorful types of agate to be found anywhere in the world. Their mode of origin is still in doubt, but all theories offered to date indicate an interesting and more or less complicated genesis compared to ordinary agates which are simply direct fillings in open cavities in igneous rocks. The Priday Ranch, situated on highway 97, near the little station of Willowdale, has produced hundreds of thousands of superb thunder eggs, along with the well known plume or flower agate, and a host of petrified woods, and other quartz family minerals. Collecting was first done on this property in about 1935, and it has been said that the value of the gem materials produced since then is considerably greater than the price this 50,000 acre ranch brought when it changed hands recently.

For a long time all visitors were generously permitted to freely enter this private property. Then for various reasons the owners were obliged to hire a special watchman to guard against fire, open gates, and what not. This entailed charging each carload of visitors a small entrance fee to pay the wages of the watchman. Seemingly this did not prove satisfactory, as some visitors would be enabled to slip past one of the many gates, and before the watchman could collect the fee they would be on their way. Finally the mineral and gem rights were leased out to various people on an annual basis, with visitors admitted by payment of a daily digging fee. This too did not appear to prove satisfactory. As a result this locality has been closed to visitors most of the time during the past few years. Reliable information is lacking regarding the future, hence no details will be given here, as it is probable the locality will not be available to the general public. For a time the locality was worked by the lessors, using power machinery, no reliable information is available on the value of the production by this method. Fine specimens from this locality are in private hands, and available from a number of supply houses, but likely in the future Priday Ranch locality specimens will become scarce, and the finer examples bring a premium price. Thunder eggs are found at a few other localities in the western states, but none can equal those of central Oregon.

Thunder eggs average about four inches in diameter, but at a few localities in Oregon huge specimens have been found, notably on the east side of the Deschutes river, about five miles south of Maupin, high up on the side of the river canyon wall. Some of these specimens are up to five feet in diameter, and none have been removed intact, but many were ruthlessly broken by unthinking persons. A road runs south, following the east bank of the Deschutes river.

### Eagle Creek

About ten miles south of Maupin, is the well known Eagle Creek locality. One of the largest perlite deposits and mines in the country is located at the mouth of Eagle Creek where it enters the Deschutes river. On the high hills south and west of the perlite mines, large quantities of uraniferous agate and chalcedony have been found. Some of this agate is nearly jet black, and well suited for polished specimens, but most of the uranium bearing agate is suitable only for fluorescent specimens. Many of these huge specimens show a remarkably brilliant and powerful fluorescence, the typical yellowish-green color of included uranium. The percentage of uranium present is quite small, and not of present commercial worth. Joe Davis, formerly of Portland, Oregon, was the first to bring in this material for examination. Jack DeMent of Dement Laboratories of Portland first examined these specimens and reported the presence of uranium. DeMent and the writer have made field examinations of this region, using a portable Geiger counter. High counts were recorded in many places, notably in the areas where outcroppings of uraniferous agate were noted. The source of the uranium, if one is present, has not been determined. Normally the country rocks in central Oregon are not abnormally high in uranium content, as we often find them in central Idaho, and many parts of Wyoming.

The Warm Spring Indian Reservation, south and west of Eagle Creek, and the adjacent Mutton Mountain, has yielded a great quantity of large masses of magnificent agate. Some ten years ago collectors were free to roam at will over this great area, extending from the Deschutes river on the east, to the Cascade range on the west. There are a number of magnificent private collections in Portland, all superb material from this locality. Most of the agate is found in large masses, not well suited for cabochon cutting, but most excellent for polished cabinet specimens. We will not go into detail on this locality, since the Indians are hostile to any wandering collector. However, it is possible to collect here by arranging with an Indian to act as guide, or perhaps by arrangement with the resident Agent, and possibly paying a fee into the Indian general fund. No specific information is available, and those who wish to collect here are advised to first get, if possible, permission from local authorities. If any collecting is done on the Reservation, the Indians are obviously entitled to pecuniary consideration.

### Tygh Ridge

A new locality for petrified wood is reported by the well known prospector, Thomas Kienzle of Maupin, Oregon. The locality is situated fairly high up on the range of hills known as Tygh Ridge, just west of Sherars Bridge on the Deschutes river. The locality can be most readily reached via Tygh Valley, some 4 or 5 miles west of the locality on The Dalles-California Highway.

This locality is reported to produce quite large masses of petrified wood, among other items. As to the quality of the wood, information is lacking, since the locality has been seldom if ever, visited by collectors.

### Antelope Locality

The region south and west of the little community of Antelope in central Oregon, rates as one of the oldest and best known quartz gem localities in the state, but it has long since been depleted of all surface material, except that which may be exposed by storms or in the plowing of wheat fields. We find Antelope agate mentioned in the mineralogical literature of more than 50 years ago, but only in the past 20 years has the locality been heavily worked.

Some 20 years ago, when the writer first described and brought attention to this locality, a tremendous amount of fine material was available at Antelope. For many years afterwards visitors came by the hundreds each summer, and none left without a huge quantity of fine gem material. There are few collections of gem minerals in the country not represented with material from this locality. The grass and sage covered hills surrounding Antelope, were for many years thickly covered with great quantities of huge geodes, masses of jasp-agate, agate nodules, quartz crystals, thunder eggs, and a host of similar material. It required the combined efforts of thousands of visitors, more than a decade to deplete Antelope of its surface material.

The quartz gems of Antelope seemed to run into huge sizes, for example, remarkably fine quartz crystals lined geodes, up to three feet or more in diameter were common here at one time. In a wheat field, hardly more than a stones throw, from John Silvertooth's refreshment emporium in Antelope, a farmer encountered an enormous gem quality mass of jasp-agate. The plow would bounce off the mass. After considerable digging, and likely some powerful language, two stout horses managed to drag the specimen off the field. The specimen, when seen by the writer in 1937, measured 5 feet long, by 4 feet wide, and 3 feet thick. For several years visitors were invited to take the specimen, or break off what they desired, the farmer providing the sledge. After the specimen was reduced about one-third in volume, it was sold for $5.00, plus the cost of hauling it 7 miles to the railroad station at Shaniko. Likely today the same mass would bring at least $500.00 for cabochon cutting material.

Mr. and Mrs. John Silvertooth have resided at Antelope for more than 40 years, and their kindness, generosity, and typical western hospitality is remembered by thousands of persons throughout the country. John is not an Indian chief as some may assume, judging solely by his name. A large amount of fine material still remains at Antelope, including thunder eggs, but practically all the private property is posted against entry, usually with good reasons. It is generally possible, by making proper arrangements with the owners, to enter most of the good digging and collecting areas.

Among other items, the finest iris agate found in Oregon or elsewhere, was produced in the Antelope area. No accurate estimate can be made of how much material this locality has produced, but it is safe to state that it would run into hundreds of tons, and perhaps valued at close to half a million dollars.

### Bend Region

The "high desert" region, east and northeast of Bend, in central Oregon, has produced a great quantity of quartz gems, including fine agatized wood, and huge agate and chalcedony casts after wood. Some of these casts are quite perfect, and make excellent cabinet specimens, especially the rarer ones which are often hollow and lined with large and sparkling quartz crystals. Most of these casts were once limbs or trunks of trees, originally embedded in the lava flows. The heat destroyed the original wood, but not until the embracing lava had cooled enough to leave a perfect mold. This cavity was later filled with agate and chalcedony, by percolating waters carrying the silica in solution. The following localities in the High Desert region have been productive for many years.

Part of the well known "High Desert" region situated east of Bend (Deschutes County), is in Crook County, and this area has produced a host of excellent quartz minerals, including, "thunder eggs," agatized and jasperized wood casts, agates, and various silicified woods and quartz crystal lined geodes. The principal "High Desert" deposits are situated north of State Highway 54, between Brothers and Hampton Butte, especially on the slopes of the Butte. Specimens in this region are generally collected from the surface of the rolling sage covered hills. The locality is especially noted for the large and superbly colored casts after tree trunks.

The Maury Mountain area, Lookout mountain, and Bear Creek, in the northern part of Crook County are also noted localities which have yielded various quartz minerals including large quartz crystal lined geodes, large masses of chalcedony, and agate filled nodules.

The area northwest of Prineville, is a portion of the great "thunder egg" producing territory of central Oregon, which is centered around Madras (Jefferson County).

Crook County includes a very large and sparsely settled region, where collecting has been carried out principally in the better known areas. Exploration work in this great field will doubtless bring to light numerous localities which are now not known. In exploring areas of this type, it will be found that many of the unimproved dirt roads leading to some of the localities will not be marked; local inquiry will often aid the stranger in the search for deposits.

Deschutes County, with Bend as the county seat, is well known as the summer playground for tourists visiting central Oregon. This region offers a host of sports and varying scenery; the dozens of large lakes, high up in the mountains offer excellent fishing, where the weary collector may pause to rest. There are a number of excellent supply houses in Bend, where the visitor can obtain typical local material, if time does not permit a visit to the hills.

It was in the region northeast of Bend, that the huge mass of flower agate was found in 1946. This superb mass weighing 187 pounds was purchased by the late Oscar Smith for $1,000. Additional smaller specimens were dug out, bringing the production of the "pocket" to approximately $5,000. Similar masses of almost equal value have been found from time to time in the regions around Bend.

### Glass Buttes

One of the most notable localities in the world from gem quality obsidian, is at Glass Buttes, two huge hills rising up out of the floor of the surrounding level desert. This famous locality is readily reached, on the Bend-Burns highway, some 50 miles east of Bend. The two buttes, only a few miles south of the highway can be seen as landmarks for many miles distance. This locality was a busy munitions manufacturing plant for the Indians, centuries before the coming of the white man. At one time, the discarded, broken, and partly worked artifacts of many types were scattered around practically knee deep.

The obsidian of Glass Buttes is remarkable for its many types, and it is not of the dull opaque type, all of it is translucent in large sections and nearly transparent in thin sections. Here we find superb red colored obsidian, and more rare specimens showing red and black in the same piece, with a beautiful example of flow structure at the contacts. Ordinarily obsidian can not be regarded as a good cabochon cutting gem material, but the remarkable iridescent type found here has long been used as a gem cutting material. Those who do not wish to drive to the buttes may collect material in the debris from the many highway cuts and excavations north of the buttes. The mine run of obsidian is plentiful, but some search is indicated for the more prized reds and iridescent varieties.

### Klamath County

Hyaline opal occurs in the basalts along the highway some ten miles north of Klamath Falls. Quartz crystals and groups of quartz pseudo after calcite are available on the Greensprings Road near Klamath Falls. Water worn agate is found in the gravels of the Klamath River and at a locality north of Keno.

Quartz Mountain Pass, on the highway between Klamath Falls and Lakeview (No. 66), is well named for here detrital quartz minerals are found scattered over a wide area. The writer made a brief exploration of this locality a few years past, only a small area was visited, but the region holds some good possibilities for those who take time to carry on a systematic search. A locality some ten miles south of Quartz Mountain Pass, has produced some remarkably high grade opalized wood; the locality was not visited by the writer, but it was understood to be private property. The Bigg Falls Creek area is also productive of various quartz minerals.

Gus Doring, well known collector and prospector of New Pine Creek, Oregon, has found what may prove to be an excellent gem mineral locality. Samples of excellent jasp-agate have been received.

The locality found by Doring, is on the highway between New Pine Creek and Alturas, California, 8 miles south of New Pine Creek. The gem material has been exposed in the highway cut, in a white volcanic ash material.

### Agates With Perlite

Collectors of the colorful agate-filled nodules ("thunder eggs") of the Central Oregon region have long noted that these agate masses are invariably associated with a dark colored volcanic glass resembling obsidian, and termed such.

Dr. Austin Rogers, of Stanford University, has examined specimens of this volcanic glass and suggests that the term "perlite" would be more appropriate for this material. Perlite is defined as a volcanic glass with concentric, shelly texture and usually with a notable percentage of water in chemical combination.

Just what bearing, if any, this perlite may have in the genesis of the agate-filled nodules has not been worked out, but seemingly there must be some definite relationship. At practically every locality where agate-filled nodules are found in the rhyolite of Central Oregon, a seam or flow of perlite will be noted. The nodules have, so far as can be learned, not been found within the perlite, but the presence of this volcanic glass is generally noted either immediately above or below the nodule bearing horizon in the rhyolite. The various volcanic glasses (including perlite) of Central Oregon, are generally high in silica content and would correspond chemically to rhyolite. In short, obsidian, perlite, pumice and rhyolite are essentially the same chemically but differ in texture.

Experienced collectors of agate-filled nodules in Central Oregon have learned to note and investigate outcroppings of volcanic glass (perlite), for possible association of agate. Often tracing float pieces of perlite up a hillside has revealed a deposit of agate-filled nodules.

### Bear Creek Deposits

One of the more recently discovered localities in the Bend region of central Oregon, is at Bear Creek, which has produced some magnificent material. This locality is described here by Herbert Wm. Lawson, a well known commercial gem cutter of Terrebonne, Oregon.

One of the most productive of the agate collecting areas in Central Oregon are the Bear Creek deposits. These deposits are easily accessible by car on a good graveled all-weather road. They are located approximately 20 miles southeast of Prineville, and in the center of the huge agate belt that runs north and south throughout most of Central Oregon.

To reach this area turn south in the center of the City of Prineville and take State Highway 27 which is the road leading to Post, Paulina and Burns. This road leads up the Crooked River and the drive is very spectacular and beautiful. In places the road follows at almost river level, then winds rapidly up the sides of the gorge until it hangs precariously several hundred feet above the stream, only to drop just as abruptly back again to the lower levels.

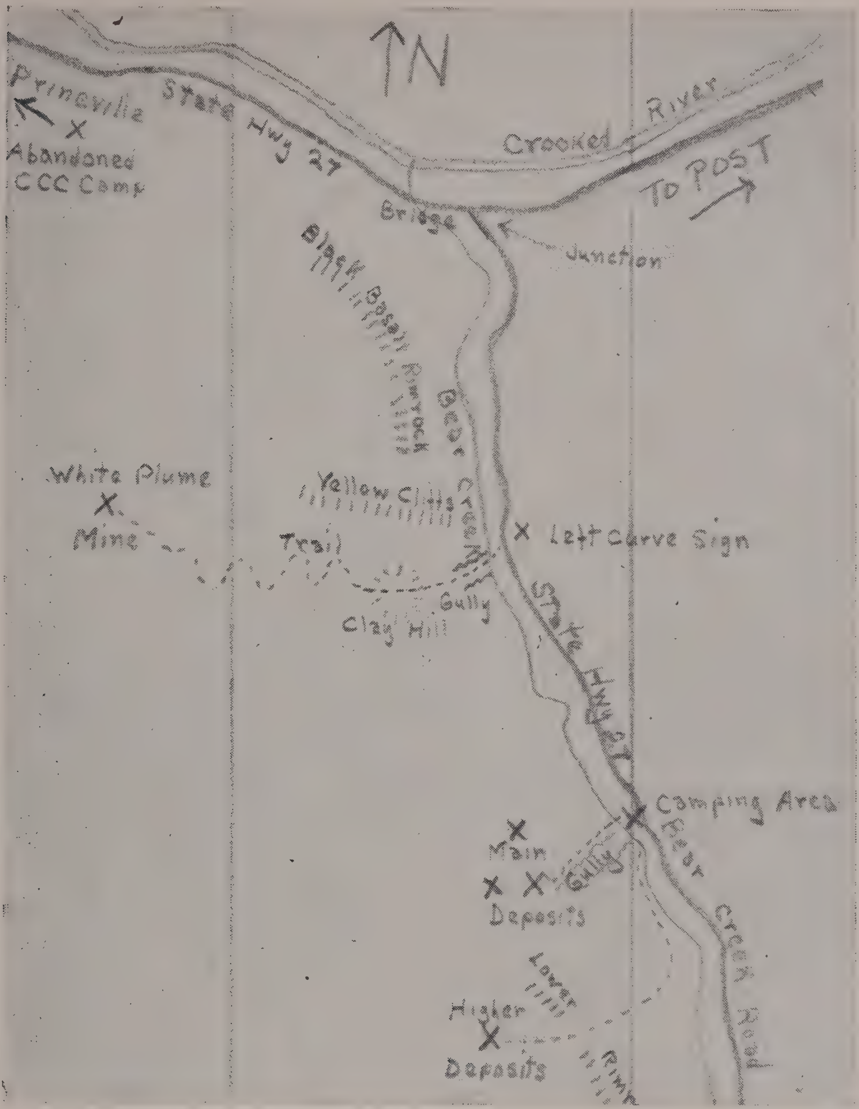
This process is repeated several times and the terrain grows more rugged, the canyon deeper, and the crags more jagged until at about 18 miles above Prineville the road crosses the river to the south side and emerges into somewhat of a valley of lower hills. The road then follows the river, passes the site of an abandoned C.C.C. Camp on the south, and about 3 miles above Crooked River bridge it crosses Bear Creek at about 100 yards above its outlet into Crooked River. Just beyond this Bear Creek crossing the road forks and the one to the south going up the east bank of the creek and marked Bear Creek, is the one leading to the agate deposits.

Exactly 2.1 miles up this road from the junction is an excellent and beautiful parking and camping spot along the creek in a park-like setting of junipers and willows. The main deposits are plainly visible from this spot and are about a quarter of a mile away. They are on the other side of the creek and up on the side of the hill directly across from the parking area. During most of the year the creek is easily crossed by stepping from stone to stone, but in the spring of the year or during a cloudburst, it may become a raging torrent as is evidenced by the deep cuts along the banks and in the gullies leading to the creek bed.

Some agate material of value is found from time to time in the creek bed and lower gullies, but the best collecting is at the mine level and extending horizontally across the hill for about a quarter of a mile. Agate and jasper is found here in profusion and in an almost endless variety of colors and types.

The mines consist of shallow pits along the hill and the contents of each digging can be easily ascertained by merely examining the chips and debris in the various dumps. However, new diggings can be started almost anywhere in this area as unworked outcroppings of the veins are in evidence everywhere.

All of the material found here is not of good quality as much of the agate and jasper is full of re-seals and some is impregnated with Calcite which makes it undesirable for lapidary work, due to the varying hardness. However, much gem material of excellent quality has been found here as well as several small lots of high quality yellow-green plume agate. Also, one piece of excellent Sagenite is known to have been found as float on the slopes above these diggings. There is every reason to believe that with proper exploration and work, that more materials of these types can be found. The materials that can be readily collected here are moss agates and jaspers of various colors with the greens and browns predominating. Also, many fine whole



quartz crystal lined geodes have been found here and fragments are plentiful.

The whole area is quite heavily agatized and float of many types can be found almost to the top of the main ridge and up and down the creek bed for perhaps a mile.

There is another notable outcropping nearby that has produced some very fine quality red, yellow and green jasper. This deposit is on the same hillside but about one-half mile farther up the creek and about one-half mile up on the hillside above the creek. It is just above the first rimrocks and is visible from the road. It is quite a steep hike up there and quite a lot of work to dig the material out, but if one is fortunate it is well worth the effort as the material is truly beautiful, and perhaps on the average is of better quality than that found in the lower diggings.

A third deposit in this immediate area that may be of interest to the more hardy and venturesome is the so-called White Plume mines. This deposit has been worked very little as it is perhaps a mile from the road and the climb is quite steep. The material found here is of good quality although most of it could not be classed as true white plume agate, but perhaps rather as a snowflake agate. It is clear with snow white or milky spots, markings and designs. However, some true white plume has been found here and it is really beautiful. Like the other workings in the area, there is reason to believe that more top quality pieces will be found here in the future.

To reach this mine it is best to start at the LEFT CURVE sign on the Bear Creek road which is about one mile above the junction with the Crooked River road and also about one mile below the parking area at the main Bear Creek deposits. From this LEFT CURVE sign the trail crosses the creek, follows a gully up to a somewhat barren clay hill, crosses over the top of the clay hill, and winds up the hillside rather steeply to the mine which is located near the top of the highest ridge and about one mile from the road.

Much of the whole mountainside in this area was at one time staked out in mining claims, presumably Cinnabar. It apparently was not present in any quantity and very little assessment work had been done and they have all been abandoned or relinquished for many years.

These collecting grounds first came to light when the C.C.C. Camp was being operated nearby. The boys from the camp collected some material here and soon others became interested. But only in the past two or three years has it become known to outsiders, and can be considered even yet as virtually unworked. Necessary tools to work in this area are the same as for most other Central Oregon localities. Namely, a rock hammer, a pick, a shovel, and perhaps a large sledge and bar. A few ticks are found here in the spring of the year. Rattlesnakes are not unknown but nothing to become alarmed about, and it is unlikely that the collector would even see one, although it is best to always be on the alert.

It is desired that the accompanying map, although perhaps not perfectly accurate, will enable anyone to find these existing workings. However, it must be remembered that this area is virtually unexplored and it is hoped that many new deposits will be found here in the near future and become known to the collecting public.

Most of this property shows on the maps as government land and is plainly marked U. S. It is unlikely that it will be closed to rock hunters and it certainly hoped that it will not, as here is one place in Central Oregon that has collecting materials in profusion, and materials to fit almost any taste—an area of beauty and an area that with proper exploration and work should produce gems worthy of any collection.

The accompanying sketch map shows the salient features in the Bear Creek region.

## EASTERN OREGON

Several years ago the writer made extended tours in the eastern part of Oregon, covering the huge areas of Malheur and Harney Counties. A description of the tour is given here.

Among the many great areas in the far western states awaiting exploration by the collector, is the great sparsely settled region comprising Harney and Malheur counties of southeastern Oregon. Each of these counties comprise approximately 10,000 square miles, or a total of nearly 20,000 square miles, and virtually all virgin territory for the collectors of mineralogical and geological material.

The two states of New Hampshire and Vermont would still have elbow room if placed within Harney and Malheur counties. In order to closely fill the 20,000 square mile potential collectors Mecca, we would require the states of Massachusetts, Connecticut, New Jersey, and most of Rhode Island.

The population of Harney and Malheur counties averages about one person to each two square miles. Over 59 per cent of the population in Harney County is concentrated in and around the county seat of Burns, with a population of nearly 4,000. In Malheur County most of the residents are in the irrigated district around Vale.

For the remaining and "wide open" spaces of these counties the population will average less than *one person to every twenty square miles,* or an equal to about 102,400 "city lots" (50x100 feet), for every cattleman, range rider, sheepherder, and homesteader. With an influx of mineral collectors and fossil hunters there would still be plenty of available space for the prowling coyote, and the ranging herds of antelope and cattle.

With the exception of the higher hills, the greater part of Harney and Malheur counties is devoid of forest growth, making the search for specimens an easy task. Numerous cinder cones, volcanic craters, and igneous rock erosion remnants are scattered about the "high desert" of sage covered plains. Fossil bearing sediments also cover extensive areas and these yield floral and faunal remains of great scientific value. Many new species of Tertiary remains have been found in this area by scientific expeditions, although very few localities have been investigated.

The lavas of Malheur and Harney counties are especially notable for their vertical and horizontal extent, in addition to their scenic grandeur. Rhyolites and basals are the dominant rocks and like the sedimentaries are principally of Tertiary age with Miocene playing the leading role.

Only a few of the most tempting localities can be referred to here; numerous additional localities have been reported but not fully verified, and an untold number await discovery by the collector who will take the time to "prospect" the country and search out reports made by range riders and others.

Two improved highways traverse the northern part of Malheur County, U. S. 28 and State 54. These lead through a thinly settled district after leaving the irrigated sections around Vale. At many localities bordering these highways, fossil remains have been found including some important mammals which were described some years past by field expeditions from the University of California.

Along Succor Creek, south of Adrian, a wide variety of quartz minerals and fossil wood has been found. A limited amount of precious fire opal has been found in this region, but little real prospecting has been done, most specimens being encountered in an accidental manner.

Nigger Rock, west of Owyhee Dam, has been recently visited by a number of field parties sponsored by the *Idaho Gem Club,* and excellent specimen material was found in the limited areas searched.

Skull Springs, on the road between Harper and Crowley, so far as can be learned remains unknown to collectors, despite the fact that sheepherders and cattlemen visiting the region often bring out superb specimens. The writer has seen a number of excellent quartz crystal-lined geodes from this locality.

West of Cow Creek Lakes in central Malheur County, and covering an area of many square miles are the weird but little known Jordan Craters, an area of very recent volcanic activity. The Jordan Craters will perhaps yield no mineral specimens of note, but offers excellent possibilities for original work in geological studies.

So far as is known the first and only time the Jordan Craters have been described in print, appeared in an early U. S. Geological Survey bulletin of 1903. In 1902, I. C. Russell, a noted geologist, made a preliminary reconnaisance of parts of Malheur County primarily in search of water possibilities for stock and agriculture. The notes of I. C. Russell appear in U. S. Geological Survey bulletin 217, issued in 1903 and long since out of print.

No water was found by Russell in the forbidding region of the Jordan Craters. He gives a superficial but very excellent account of what he was enabled to note during his brief visit.

Fully as extensive as the Craters of the Moon National Monument in Idaho, the Jordan Craters of Oregon are worthy of exploration and should be set aside as a State Park or National Monument. The Craters of the Moon Monument include some 75 square miles of recent lavas, but the developed and accessible portion includes only a few square miles. No surveys are available of the Jordan Craters, but the writer estimates the area to be at least twice the extent of the Craters of the Moon Monument.

There are four principal recent craters in the Jordan region, and these have been given numbers one to four by Russell. The four main craters extend in a north and south line, the southern one being number one. Most of the Jordan Craters rise higher than those seen in the Craters of the Moon.

Craters number 1, 2 and 3 are instructive on account of the many square miles of lava poured from them and the various stages reached in its change to smooth pasturage land. Crater number 4, at the northern end of the chain is easily the youngest of the group. This crater is possibly not more than 2,000 years of age, and on its southeastern side, and extending over an area of at least 50 square miles is an ocean of rough and black lava, devoid of all vegetation.

The writer believes that a study of Crater 4 will reveal some interesting geological history pertinent to the region. This Crater rises to a height of over 500 feet above the surrounding lava beds. In comparing Jordan Crater number 4, with the conspicuous craters seen in the Craters of the Moon National Monument, the former appears much younger. Among the lavas of the Craters of the Moon, standing (some dead) trees having an age of 300 years or more are noted, while Jordan Crater number 4 is wholly devoid of all vegetation. Hence it may be possible that volcanic activity took place at Crater 4 within the past few hundred years.

Other than the small number of local residents and range riders, very few people have visited the Jordan Craters, as there are at present no auto roads into the region proper. The approach can be made from the south from Arock, but no passable roads enter or traverse the blackened and lava scarred regions, which seemingly cooled only yesterday.

While not generally known, there are several localities in Malheur County where scientifically valuable fossils have been collected from time to time. Near the small postoffice of Rome, the Owyhee River has cut a gorge through the thick Tertiary (Miocene) sediments, and in these exposures a number of expeditions from large educational institutions have conducted successful excavations.

The beds of fine white silt near Beulah produce beautifully preserved fossil leaves, equaled by few localities in the world. Near Rockville, excellent fossil flora are available. There are literally thousands of square miles of sedimentaries exposed in Malheur County and in all probability field work would reveal additional localities.

From the geological standpoint Harney County is very similar to Malheur, but the former presents an even greater array of places of interest and possibilities. For many years the lack of adequate highways in these great areas has tended to discourage travel, but in recent years many of the dirt roads have been rerouted and improved, hence making travel by auto far less difficult.

The Steens Mountains, extending in a north and south direction for about 75 miles, is easily the most conspicuous and spectacular geological feature of Harney County. I. C. Russell, in 1903, stated that this mile-high fault scarp is the grandest in all the world. Standing on the floor of the desert on the east side of Steens Mountains a splendid view of the exposure of a mile high vertical Tertiary lavas can be seen.

In some places the fault is vertical, with hundreds of feet of erosion debris piled in cone-shaped aprons at the foot of the rimrocks. At some points it is possible to count as many as 42 distinct and separate flows of lava, exposed in this mile-high fault scarp. The highest points in the Steens Mountains are 10,000 feet above sea level, while the floor of the great sage desert to the east has an elevation of 5,000 feet above sea level.

Situated on the shore of Borax Lake, near Fields, is the only "Borax House" in the world. This unique structure was made of blocks cut from the hard borax incrustations, deposited by the thermal waters. For nearly forty years this structure has withstood the attacks of the elements, as it seldom rains in this arid region.

Borax Lake, covering several acres, is fed by heated artesian water which can be seen "boiling up" in the middle of the lake. The water is of interest in that it carries an unusually high percentage of dissolved borates. At one time a small refinery was operated and a high grade of medicinal boracic acid was manufactured from the lake water. Despite the fact that the lake water has a temperature of 130 degrees, small fish seem to thrive in the lake water. Dr. Carl Hubbs, noted icthyologist of the University of Michigan, a few years past collected fish here that proved to be new to science. The tired and weary traveller will do well to pause at this unique watering place. In bathing in the lake no soap is needed for the dissolved borates are of a sufficient concentration to act as an effective solvent. Moreover, the water is of an ideal temperature for a pleasant bath. Generally the locality is deserted or perchance the Borax House may be temporarily occupied by a wandering prospector or hunter. The surrounding area is also a sanctuary for wild fowl.

Probably the finest and most spectacular fossils found in Harney County occur in a deposit of snow-white diatomaceous earth of Trout Creek. A number of species of Miocene flora, new to science, have been obtained by commercial collectors, and it is understood the locality has produced about $10,000 worth of these marvelous and unbelievably beautiful fossil leaves. Among other institutions the University of Michigan a few years past purchased a large number of specimens. The leaf imprint being nearly black, stands out in clear contrast against the snow-white matrix. Owing to the softness of the matrix it is possible to quarry and trim the specimens with great ease.

Several localities for quartz minerals including colorful "thunder eggs," geodes, and fossil wood have been reported near Fields. Definite information is lacking and the writer has not investigated these reports, but specimens were seen.

One of the largest and most spectacular of Oregon's "lava caves" is Malheur Cave, situated in Harney County and easily accessible by auto. The locality is of considerable geological interest. It is possible to walk for a half mile into this tube of hollow lava, then board a rowboat and complete the one mile journey underground.

Recently Alfred Brown, collector of Burns, discovered five new opalized forests in the vicinity. Two of these were visited by the writer through the courtesy of Mr. Brown.

Although as yet undeveloped, the most

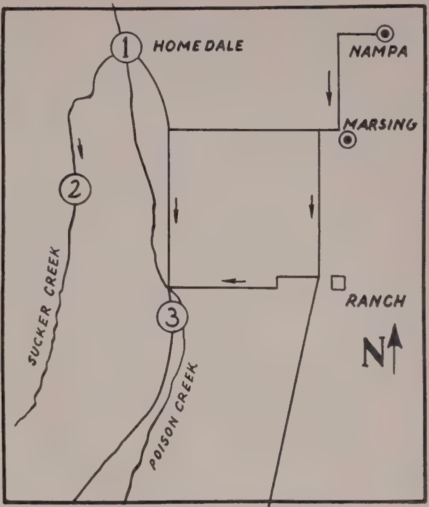
promising forest appeared to be in Myrtle Park, on the slope of Silvies River Canyon. Only a few logs have been exposed by digging, but surface indications point to many fine specimens loosely covered by surface debris. One log was part exposed and found to consist of beautiful black and white opalized wood, well suited for specimen purposes. This log was exposed for a distance of several feet and appeared to be over three feet in diameter.

The Myrtle Park locality is exactly 29 miles from the Arrowhead Hotel in Burns, via the Canyon City Highway. Leave main highway on Myrtle Park road, 18 miles from Burns. The locality is exactly 6.8 miles from main highway. The wood occurs on the summit and slopes of a small hill a few hundred feet south of the dirt road. Sedimentaries are exposed on the river canyon slopes and in all probability wood will be found at several places by prospecting for surface "float". Common green and red opal occurs in profusion in addition to the wood. The forest is of the drift type, and as yet no study has been made of the wood, but it appears to be largely conifers.

On the main highway between Vale and Burns, the recently excavated highway cuts have exposed no less than thirty areas where excellent fossil flora may be collected in the laminated claystones. So far as can be learned no detailed study has been made of the flora of this locality. The best exposures are seen just west of the Juntura Highway junction, in the Stinking Water Mountains. Collecting is easy here for the laminated sediments fracture readily to expose perfect fossil leaf imprints.

A few years after this tour was made of Harney County, Al Brown, of Burns, Oregon, made a discovery of the new and spectacular thunder egg locality. The locality is some 22 miles east of the town of Burns on Highway 20. Near a filling station, a dirt road leads south from the main highway, to the locality a few miles distant.

Superb agate filled thunder eggs occur here, and are unique for their colorful character, and unusually large average size. A dozen or more "digging" spots have yielded thousands of specimens. A nominal entrance fee is made, and those who wish to enter the property, should make local inquiry of Al Brown in Burns. With more field work in this great region of rhyolite rocks, it is quite likely that many more notable discoveries of silica minerals will be made.



HOMEDALE AREA

K. N. Dahle of Key West, Florida, who recently spent a summer vacation collecting in Oregon, announces the discovery of a new locality in Oregon not previously reported. The locality is situated about 30 miles east of the Malheur Caves in Malheur County, Oregon.

The best route to reach the locality is from Harper on main highway Number 54. Take dirt road south to the region known as Barren Valley. This locality appears to be a new "thunder egg" strike. K. N. Dahle collected large choice specimens from the rhyolites of this region.

Skull Springs, situated in the region has also been reported productive of various choice quartz minerals, including quartz crystal geodes, "thunder eggs," opalized wood, and jasper. These reports have been received from range riders at various times, over a period of years, but so far as can be learned no collectors have been enabled to find the exact spots. North of Crane are the well known "thunder egg" localities discovered a few years past and which has produced thousands of superb specimens of these unique agate masses.

### Garnet Locality

A few miles south of Pilot Rock, Oregon, on the Lehman Springs road, is a place known as Mountain Home. In the early days it was an overnight stopping place, being located just one days' travel from Pendleton, via horse and buggy. Here was the former scene of much revelry of an evening at the end of a hard day's drive—a "half-way" house for the hardy mountain travelers. Mountain Home Inn was also a haven for the cattlemen, hunting parties and huckleberry pickers.

Mountain Home is situated well up on the shoulder of the Blue Mountain range near the head of Bear Creek, along which the best garnets are found. Two miles before reaching Mountain Home the visitor will observe an outcropping of rock with bright sheen — a mica schist extending along the highway for a mile or more. It is this mica schist that carries the garnets, and even the sand along the roadway is slightly pink in color due to the numerous small garnets.

About midway along the outcrop of mica schist is a vein of white quartz crossing the road and marking a good place to leave the car and descend the hill to Bear Creek. Along the creek where the erosion has cut the mica schist will be found quantities of garnet both within the matrix and as an alluvial. Much of the garnet found here is too small for gem cutting purposes, it does afford excellent specimen material. The dozens of small garnets disseminated throughout the schist matrix are attractive for cabinet display material.

There is much of interest for the mineralogist in the great area around Pendleton, Oregon. The noted zeolite locality of Ritter Hot Springs is only a short drive distant and here the connoiseur or expert will find much to interest him and a locality where little collecting has been done. Some ten years past Ritter Hot Springs was visited by a party of scientists from the U. S. National Museum; a preliminary examination revealed many rare and interesting specimens.

Fossil remains, including the mastodon and elephant are prominent in the Pendleton district. The famous Birch Creek fossil beds nearby have yielded a number of remarkable specimens of floral remains that once thrived in the balmy tropical climate in ages gone by.

## Succor Creek Locality

Succor Creek, in Malheur County, is a region replete with many interesting localities, as well as scenic grandeur, and very little collecting has been done here. The region can best be reached by going to Nyssa and then take the highway leading toward Jordan Valley, Oregon. Some 35 miles south of Nyssa the highway enters the scenic canyon of Succor Creek and it is in this region that many interesting specimens have been found. The specimens are generally found loose on the sides of the canyon and in the creek bed. Near a place called Chimney Butte some excellent material has been found.

Large beds of agate, geodes lined with sparkling quartz crystals, large masses of silicified and opalized wood, fossils, Indian relics and many other specimens are available in this region. In the past small amounts of precious fire opal have been obtained here. On another highway south of Homedale, near the town of Enterprise, Idaho, can be seen the old opal diggings. At these old diggings some years past thousands of dollars worth of gem fire opal were obtained.

The region is also of special interest to the student of Indian lore, and many specimens pertaining to this can be had here. The picture writings on the rocks of this region are well known.

In the upper reaches of Succor Canyon, the valley deepens and the sides become quite steep making ascent difficult, but excellent material can be found in the creek bed at many points. Very little traffic passes over this highway and the locality is more or less unknown, except locally. Since extensive opalization has taken place in this region, it should yield in time further finds of gem opal.

## Baker Region

Baker, in the eastern part of Oregon is in the center of an old mining region. The old mine dumps around Baker yield a variety of minerals suitable for collections, but comparatively little gem material is available, but sometimes the unexpected occurs.

Several years ago, near the old mining camp of Greenhorn, in the Baker district, collectors noted pear-shaped masses of colorful silicified material. These curious masses, up to 12 inches or more in diameter, had been originally encountered as boulders in a gold placer mining operation. This material, along with numerous other boulders of rock interfered with the placing, and they were piled into neat rows at one side, where they remained unheralded for some 50 years.

Collectors who first examined this material, a colorful red and yellow jasper, noted peculiar shaped "eye" or obicular structure in the material, and assumed it to be some type of ancient "palm" wood. It takes an excellent polish, and makes superb cabinet specimens. Finally some specimens were sent to Dr. Chester A. Arnold, noted paleobotanist at the University of Michigan. Dr. Arnold promptly identified this material as a new and rare variety of *Tempskya*, a fossil plant from the Cretaceous, found at only a few localities in the world. According to Dr. Arnold these valuable specimens are perhaps the finest of their kind ever found anywhere in the world. Some of the intact specimens weighing more than 30 pounds. On a field expedition to the locality, Dr. Arnold collected a quantity of fine material which has been placed on exhibit in the botanical museum at the University of Michigan. All the fine specimens have likely been gathered up at the locality, but by diligent search minor examples and fragmentary masses may be found. The material is mainly of scientific interest, but it is also superb lapidary material.

# Washington

## The Opalized Forest State

The seventy thousand square miles comprising the state of Washington present to the tourist numerous areas of scenic grandeur, regions holding considerable geologic interest, and a diversity of excellent gem mineral, and fossil localities. The mountainous and scenic areas are principally in the western half of Washington, while the best known collecting grounds are in the central and northeastern parts of the state.

A belt some fifty miles wide in an east and west direction, and extending north and south for a distance of over 150 miles through the central part of Washington, comprises a region which yields quantities of magnificent specimens of opalized wood. Excellent specimens have been found at dozens of localities in this great region of petrified forests. Ginkgo Petrified Forest State Park is in about the center of the fossil wood area.

The northeastern part of Washington represents a region of extensive mineralization. The numerous metallic and non-metallic mines and prospects in this part of the state offer a splendid field for collecting.

Geologically and mineralogically there are a great many areas in Washington which are comparatively unknown. Very little collecting has been carried on hence this great field offers attractive possibilities for the student and collector.

There are comparatively few fine deposits of agate known in Washington, and agate filled thunder eggs, common to Oregon, are lacking in the state. But what Washington may lack in the agate line, the state may boast of many other excellent gem localities.

### Carnelian Agate

One of the best known agate producing regions in Washington, is the area east and south of Chehalis, in western Washington. A great quantity of carnelian agate has been found here, notably along the many gravel bars of Lucas creek, where collecting may be best done in the late summer, at low water. Captain Russell D. Powell gives us an excellent general description of this region, which appears below.

It is considered axiomatic that good mineral locations are accessible only after traversing miles of bumpy road followed by a mountain goat's climb. But once in a while the engineers slip up and actually lay a road directly to a specimen location, seemingly as a come on for the collector. And just that has occurred in the case of the Newaukum River agate bars in southwest Washington.

Located on a surfaced road only a few minutes drive east of the Pacific Highway (U. S. 99), hundreds of pounds of agates, geodes and geode fragments, other quartz minerals and fossil wood and bones are removed from there each season, and the supply is constantly being replaced. The beds are reached by turning east off Highway 99 at Forest, about five miles south of Chehalis, seventy miles from Tacoma and eighty-eight miles from Portland. The central point of the area seems to be about the covered bridge over the north fork, a couple of hundred yards right on a gravel road at the school four miles up from Forest. However, the pickings are reported good for a couple of miles in either direction. An interesting collection of this material may be seen in front of a roadside curio shop in the southern outskirts of Chehalis. There must be a ton of material on display, all under a spray of water to bring out the color of the agatized material.

For collectors with time to cover two locations, the well known Salmon Creek "coprolite" deposits are in the same vicinity, near Toledo, fifteen miles south of Chehalis.

The "coprolites" are found on the gravel bars along the river, mostly in large chunks, some running twenty pounds or more. The annual supply of material is derived from undercutting the banks and from reclassification of material during the winter and spring high water. When I visited the location in mid-July many collectors had already covered the stream, yet I took out about ninety pounds of material in a three hours' search extending over not more than four hundred yards, and that under a handicap of lame ankles. The river is easily fordable at low water, but waders, or bathing trunks and canvas shoes, are required because of the frequent crossings demanded. A good sized container, such as a grain sack, is needed to carry the material out. Other useful articles of equipment are fishing tackle and license, since this is a good trout and steelhead stream, though heavily fished.

The banks of the river show beds of classified gravel, clay, and loam rising about five feet above the present stream level. These banks extend back to a second plateau, the main valley floor; the valley itself being flanked by low hills. The old river gravel seems to be the source of the material. It is slightly cemented, iron stained, and in places where its level meets that of the stream it forms low ledges across the current. This gravel in turn must have been derived from older glacial deposits since the quantities of fossil driftwood occurring could not have originated in these gravels, or in the glacial deposits themselves, for that matter. This wood differs considerably from that found in the *Vashon formation* further north, in that all the specimens have black cores, and their average size is much greater. The deposits differ in another characteristic from the Vashon beds in that comparatively little jasper is in evidence.

The wood indicates a considerable history of travel and metamorphosis. In its first stage it stood in a forest whose location is subject to some dispute. Then it became driftwood in some unknown stream, was broken and worn into approximately its present form, and was deposited in a detrital plain or delta where petrifaction took place. Next the glacial phase, when it was transported by ice and freshet to a point in the prehistoric Newaukum water shed, from whence it was again washed down to the present gravel beds. And now it is again being transported and reclassified by the present river, and like our household possessions, worn and damaged a bit more during each move.

Unless so late in the season that the stream has been overrun by collectors, a goodly quantity of specimens can be guaranteed, and under any circumstances except high water, some material will be found. For best results, though, one should get well away from the covered bridge, since this is the favorite starting point for most parties. Since all the land along the river is devoted to dairy pasture, care must be taken not to damage fences or leave bars down or gaps open when found closed, or vice versa. Carelessness in this regard will almost certainly result in permanent closing of the whole area to mineralogist and fisherman alike.

Editor's Note — The region described above by Captain Powell has been productive of very fine examples of carnelian agate, some of considerable size, but averaging from 3 to 5 inches in diameter. The "coprolite" mentioned is not of animal origin, but does resemble the true coprolite very strongly. Lucas Creek and Salmon River are also well known localities in the area described above.

### Cloverdale

One of the newer localities in western Washington, is the Cloverdale region. Cloverdale is 1 mile east of U. S. Highway 99, the turn off being 4 miles south of Kalama. The agates are found on the hills and along the creek bed, about 3 miles east of Cloverdale. Surface material is available at places, but digging is indicated to obtain the best material.

Quartz minerals are the chief items available at the Cloverdale locality. These include excellent and fairly large masses of finely lined and banded fortification agates. Carnelian is also available. A considerable area, especially on the hill, is covered with fragments which have weathered from the matrix. Probably the source of these can be located and intact specimens found.

A great many small but fine enhydros, better known as "water agates", have been found at a locality 2 miles east of Kalama, in a stream canyon near the old railroad bridge. The specimens are mainly small, averaging less than an inch in diameter, but larger ones are also found. The agate surrounding the bubble is usually clear enough to plainly show the hermetically sealed bubble of water. Some specimens show multiple bubbles, some of the bubbles are movable, while others are in a fixed position. Enhydros are not regarded as rare, but this locality is unique for the reason that almost every small agate found here is an enhydro.

### Agate Beach

The locality of Agate Beach, Washington, yields excellent small gem pebbles of jasper, and is an excellent spot to rest for a few days, The locality is situated on Juan De Fuca Strait, across from British Columbia. Take Highway 9A, east of Port Angeles, and at Joyce turn north — the locality is only a short distance from Joyce.

Cabins at Agate Beach are available, and the proprietors also own the beach, so permission to collect is in order. The small water-worn pebbles weather from the surrounding conglomerate, and gather in huge piles on the basin-like beach. The gem pebbles are often of good color and suitable for cabochon cutting. The locality is also an excellent scenic spot.

The name "Agate Beach" can be considered a misnomer, as agates do not occur there—only jasper, chert and opaque quartz in water-worn pebbles.

### Cle Elum Region

The region northeast of Cle Elum, Washington, is noted for its fine blue agate and quartz crystal geodes. There are a number of localities in this region where local collectors have obtained superb quartz minerals, including specimens which lend themselves to lapidary treatment. Practically nothing has been published regarding this region. Those who visit here should search about as the localities indicated on the accompanying sketch map are by no means all which are available.

The little town of Cle Elum is situated on Highway 10 some 70 miles east of Seattle, Washington, and about 25 miles north of Ellensburg. East of Cle Elum is an important highway junction, to reach the quartz mineral diggings, take the north fork, following Highway 97.

About five miles from Cle Elum the first of a series of small canyons or draws will be reached. These small canyons enter the highway from the east. Some exploration work has been carried out in these canyons by local collectors. At some times of the year small creeks follow down the canyons.

The first canyon reached a short distance from Cle Elum was once occupied by a logging railroad. It will be necessary to walk up the old railroad grade a distance of nearly two miles, until an old skid road branching off to the north, is reached. Superb and large masses of a type of blue agate is found in the volcanic rocks above the railroad grade. Geodes may also be encountered. The agate deposits at this locality are said to extend over a considerable area.

The next canyon is less than one-quarter mile to the north. The third canyon may be entered by an old logging road which winds back and forth across the creek. About one mile from the main highway, an old rock slide of considerable extent will be noted to the north. Large masses of fine blue colored agate is available in the debris of the rock slide.

The fourth canyon, shown in the sketch is reported to yield agate and quartz geodes, searching the canyon slopes and bottom of canyon. Much of this region is overgrown with brush and timber which makes the search difficult in places.

Crystal Mountain, some 5 miles west of Mineral Springs, has long been a producer of fine quartz geodes. Considerable collecting has been done here, so fine specimens may no longer be expected on the surface. Digging is indicated when good surface indications are noted.

## CENTRAL AND EASTERN WASHINGTON

One of the best informed mineralogists in the Pacific Northwest, is Charles O. Fernquist of Spokane, Washington. He was formerly curator of mineral at the Eastern Washington Museum at Spokane. He is also one of the founders and a past president of the Columbia Geological Society of Spokane. Fernquist has visited many of the notable localities in Washington. Below is a comprehensive description of many of the better known localities in the state, by Charles Fernquist.

In the January 1934 issue of THE MINERALOGIST Magazine the writer described the gem minerals of Washington for the first time. Many of the present readers do not have this issue, and the publishers state that copies have long since been exhausted.

Since 1934 interest in gem stone collecting and lapidary work has grown enormously. Where in 1934 there were only a few dozen people interested, now there are thousands.

U. S. domestic gem stone production was at its lowest ebb in 1934. There was, according to the United States Bureau of Mines, a gem mineral production of only $3,000 that year. In 1938 this had risen to over $127,000, a gain of 4,200 per cent. What other business can show such a large increase in only four years?

Also the U. S. Bureau of Mines gives Washington a production of $8,500 in 1938, while in 1934 the gem mineral production in the state was nil. Most of this material has been collected by amateur mineral collectors and gem stone cutters. Some of the finished products remain in private collections, while some has found its way through mineral dealers into museums and the gem trade.

Numerous persons in various parts of Washington have built up very beautiful, and some valuable collections of gem minerals, found in Washington and other Northwest states. The hobby of gem stone cutting has made tremendous gains during the past few years.

The information for this article has been gained from numerous sources, as indicated, and by field trips by the writer. The listings below are not complete, as some localities are not known to the writer. Still it will constitute the most complete list published to date.

*Diamond* — In the State of Washington diamond finds are very rare. The most likely areas for the occurrence of diamonds would be in a detrital materials derived from the peridotite rocks of the Cascade Range. In placer mining for gold in these regions an occasional diamond is likely to appear in the placers, and may be recovered if recognized as such.

Microscopic size diamonds have been reported in the black sand concentrates of the coast. A diamond weighing 4 carats was reported in 1932 from a gold placer working in Skamania County. It is said to have been of a pale yellow color and free of flaws. A gem stone collector is said to have examined this find and verified its authenticity.

*Gold Nuggets* — Gold nuggets in a size and shape adapted for jewelry have been found in the various gold placers of the state. Swauk Creek, near Liberty, in Kittitas County, is the most notable locality. From this locality many large nuggets of gold were found some years ago, including one worth $1,100 at the old price of gold. Also at this locality fine crystallized gold has been found in the quartz claims. Sometimes crystallized gold is found replacing Eocene fossils.

*Gold Quartz* ("picture rock") — In Okanogan County, on Palmer Mountain, near Loonies, some very rich gold quartz has been recovered. The gold is very coarse and is in a milky white quartz and well adapted for cabochon cutting. The writer has seen specimens with gold running from $60,000 to $80,000 to the ton.

*Pyrite* — In good crystals, may at times be found in the metal mines of the state. Pyrite finds use in inexpensive costume jewelry. It is generally cut with a flat back and with a series of triagonal facets. Pyrite is often sold under the name of marcasite.

*Fluorite* — Up on Jack Creek, about four miles from Keller, in Ferry County, is an occurrence of a fluorite vein in granite. Most of this material is from light to dark green and quite translucent and suitable for cabochon cutting and other ornaments. Under the "black bulb" this fluorite will fluoresce a deep purple.

*Quartz Crystals* — Good quartz crystals suitable for specimen, lapidary and optical purposes are found at times in metal mines in all sections of the state.

On Crystal Mountain, Kittitas County, 2½ miles by forest trail from Liberty, loose crystals of quartz and crystal lined geodes occur on the surface, having weathered from the surrounding basalts. Some of the geodes are of large size.

Along the electric railway, in a cut below the tin mine on Silver Hill, near the city limits of Spokane, a cavity of doubly terminated quartz crystals were found in a pegmatite dike by two members of the *Columbian Geological Society,* Robert Childs and John Salie.

North of Spokane on Wild Rose Prairie is a large outcropping of clear translucent massive quartz.

On the Spokane Indian Reservation a little north of Detillion bridge, about half a mile north of the Indian church, on the east side of Highway 22, there is a ridge of andesite. Cavities in this andesite produce quartz crystals. Specimens are also found weathered out and resting on surface or in surface soil. Chalcedony and calcite occur with the quartz.

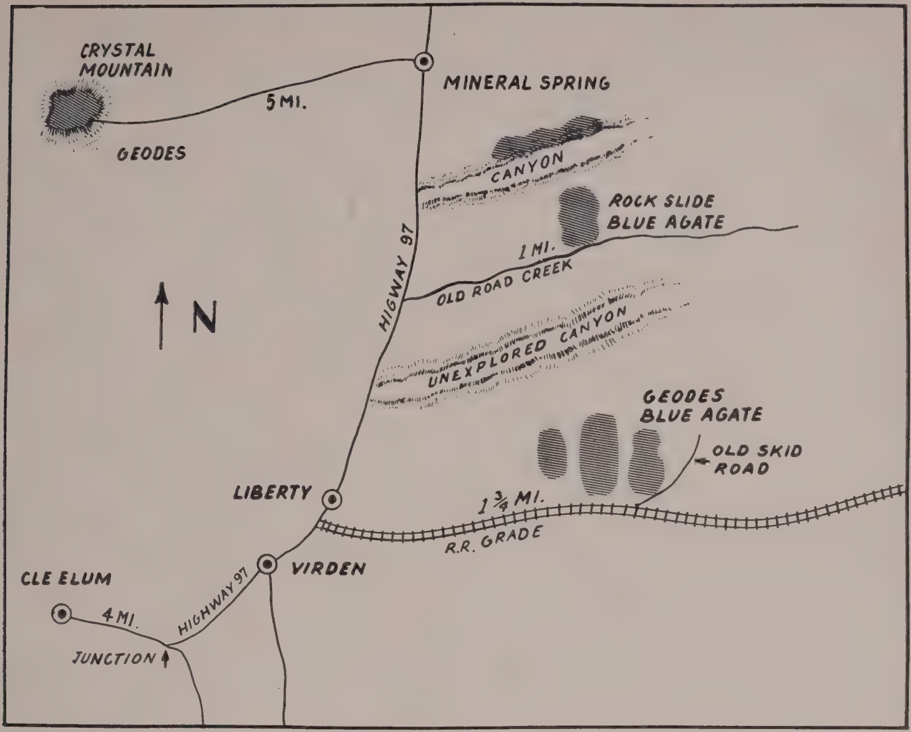
*Amethyst* — North of Curlew near the Canadian line a deer hunter recently found a fine quartz crystal geode. Some of the crystals were of a pale amethyst color. Amethyst is also reported to occur 15 miles northeast of Republic.

A visitor to the Spokane Museum in 1939 showed the writer a specimen of quartz and pyrite, with amethyst, from 5 miles northeast of Ruby, on the east side of the Pend Oreille River in Pend Oreille County.

About one mile north of Clay City, on a ranch, amethyst forms part of a mineralized vein.

*Rose Quartz* — On Wild Rose Prairie, north of Spokane, there is a large mass of clear translucent quartz, forming a hill. The writer has seen a specimen from this locality, a pale pink rose quartz.

*Smoky Quartz* — On Mica Peak, about 25



CLE ELUM, WASHINGTON LOCALITY

miles northeast of Spokane, a crystal of pale smoky quartz was found recently by a local collector.

*Agate* — Dr. H. C. Culver, State Supervisor of Geology, has informed the writer that agate is found near the mouth of the Grande Ronde River. At Washougal, in Clark County, fine moss agate is reported. At the Bell Mountain Mine, also in Clark County, there is considerable green plasma with veins of red jasper.

Some of the petrified wood at the well known locality of Saddle Mountain in Central Washington is agatized and some opalized. While collecting in this region the writer has found specimens of chalcedony. Variously colored jaspers have been found at the Saddle Mountain locality. Water worn pebbles of agate occur along the Columbia River near Vantage, in the central part of the state. Agate is also likely to be found on any of the gravel bars along the entire length of the Columbia River.

*Jasper*—Along the beaches at Joyce, Clallam Bay, and Port Angeles, in northwestern Washington, small but colorful pebbles of jasper occur in profusion. The best known locality being Agate Beach, about 2 miles north of Joyce. The term "agate" beach is misleading, for practically no agate is to be found, but plenty of jasper and a host of colorful pebbles, including quartzite which was probably taken for agate. At Agate Beach the entire rugged beach line consists of thousands of tons of gravels. A search will reveal many types of jasper, but the most coveted specimens are the orbicular jaspers of gem quality. The beach at Ozette is also productive.

*Enhydros* — The most notable locality for agates containing water is the basalts east of Kalama, a town on Highway 99. At the foot of towering cliffs of basalt literally thousands of small enhydros may be collected in a single day. Few are over an inch in diameter, and many much smaller. Dr. Roach, a collector of Kalama, was first to call attention to this locality, which was reported in an early number of THE MINERALOGIST Magazine.

The late Dr. George Kunz, in one of his papers, mentions remarkable specimens of enhydros agates, pseudo after various marine life—oysters and clams—from Cowlitz County. Some of these are up to two inches in diameter and composed of beautiful white chalcedony, and valued, according to Kunz, from $1.00 to $15.00 each. In the opinion of the writer these are more likely to be from the beaches of Pacific County rather than from Cowlitz County.

Along the entire length of the Grays Harbor ocean beaches water worn pebbles of agate, jasper and chalcedony occur in the gravel bars. The beaches of Jefferson County are also productive of "beach gems." Near Queets and Kalaloch, in Jefferson County, a fine gem quality orbicular jasper is found, known locally as "flower" stone.

*Blue Agate*—On Crystal Mountain, about 2½ miles from the small mining camp of Liberty, pale blue agate is thickly scattered on the basalt slopes, and also in cavities in the basalt. Below the mountain, on the sage covered plains, there are pebbles of fine blue agate, water worn and in sizes up to 5 or 6 inches. The larger specimens are rare. This fine blue agate has not been found in place but is presumed to have been derived from the basalts comprising the surrounding hills.

*Bloodstone* — Fine bloodstone is reported to have been found near Chehalis, a town on Highway 99. Chalcedony and agate occur in the gravels of the Newaukum River of Lewis County. Agate of good quality and related material is available in many of the stream gravels south and east of Chehalis.

*Carnelian Agate* — One of the most noted regions in the country for fine carnelian agate are the gravels of Salmon River, Cedar Creek and Lucas Creek, in Lewis County. Associated with these fine carnelians are the familiar "coprolites"—strange masses of material which strongly resemble fossil animal dung. They are said (by Dr. H. C. Dake) to represent stalactites of hematite and limonite.

The carnelian of Lewis County runs to remarkably large sizes, a few over a foot in diameter have been found, and specimens several inches in diameter are common. The best time to search is during the low water periods of the late summer and fall, and the best hunting appears to be in the upper reaches of these streams.

*Myrickite* — Clear chalcedony with inclusion of cinnabar, known as "myrickite," occur in the quicksilver mines of Morton. This material is often superb for gem cutting and specimens to brighten up an otherwise dull cabinet.

*Agate Pseudomorphs* — Chalcedony and agate replacement after gasteropods and bivalve shells are numerous on the beaches near Lebam in Pacific County. Some replaced nautilus shells have also been found. Specimens of this material which have at various times been reported from South Bend and from Cowlitz County, probably originated at Lebam. Many of these fascinating replacements contain water and are classed as enhydros.

*Moss Agate*—In 1921 the writer collected some chalcedony and moss agate along a creek north of Nespelem, on the Colville Indian Reservation.

*Silicified Wood* — Near Tono, south of Olympia, petrified wood, chalcedony, agate, and jasper are plentiful. To obtain specimens it is necessary to dig about 2 feet through sand. Some of the specimens are of large size.

*Onyx* — In a very early report of 1891 an occurrence of onyx in the Naches district of Yakima County is briefly mentioned. It is said to be of good gem quality. Agate, chalcedony, and jasper have been found in various parts of Yakima County. While driving tunnel number 2 of the Roza Reclamation Project a number of petrified logs were encountered, one measuring 8 feet in diameter.

Opal in its many forms is the most abundant gem mineral from the Cascade Mountains to the east boundary of the state. Common opal in a great variety is very abundant in the Columbia River basalts, and in every county in central and eastern Washington. Very little of this common opal is of gem quality.

Opalized wood is also very abundant east of the Cascade Range, and this material is widely gathered for lapidary treatment and study purposes. The opalized wood is notable for its colorfulness and suitability for cabinet purposes. The complete limb and tree sections are especially prized.

The first collectors of common opal and opalized wood were the early Indians, long before the coming of the white man. The aborigine learned that this material was well suited for artifacts, and tools of various kinds. Arrow points and other artifacts made from common opal and opalized wood are very colorful and highly prized by collectors of Indian relics.

The Columbia River Indian opal artifacts are equal to the finest found anywhere in the world. Some of the small perfect points are known as "gem points" and are often used for jewelry purposes. The remarkable and delicate workmanship indicates that the Indian of this region must have been a master craftsman. All along the whole length of the Columbia River, and other sections of eastern Washington, these fine artifacts may be collected.

Opalized wood is of very common occurrence throughout central and eastern Washington. During the great flows of Miocene lavas, the noted "Columbia River basalts," there were periods of quiescence between the flows, when soil and shallow lakes would form on the surface of the lava flow. On this soil and along the shores of the lakes, great forests flourished, only to be later covered by outpourings of lava, volcanic ash, and other igneous debris. Heated waters brought silica to "petrify" the trees. The great areas of opalized woods, when found in position, are generally associated with lake bed sediments, volcanic ash, soil, or "pillow" lavas.

In prospecting for opalized woods it is customary to search for seams of "volcanic ash" along the sides of a canyon. The opalized woods are found at various horizons, between the successive flows of the Miocene lavas. The wood structure is frequently beautifully preserved on the cross section. Polishing a cross section of a limb or tree trunk greatly improves the specimen. Heavy and massive book ends are often cut from the colorful opalized woods.

Some of the most notable localities where opal and opalized wood have been found are given below.

The Rattlesnake Hills of central Washington have been productive of large and superb opalized logs. Some remarkable specimens of this material was seen on exhibit at the Portland Convention in October 1938 from the private collections of local collectors.

On the east side of Moses Coulee in Grant County, logs of opalized wood may be seen projecting from the basalts. Often these specimens are high up on the vertical walls, but stand out in strong contrast against the dark colored basalts. A number of these specimens were pointed out to the writer by Charles Simpson, curator of the Ginkgo Petrified Forest Museum. At Trinidad, in Grant County, some fine large opalized logs have been found. In the Grand Coulee, near Blue Lake, brown opalized wood is reported. Near Neppel the highly prized petrified ginkgo wood has been found. So far as can be learned fossil ginkgo wood is found only in Washington and nowhere else in the world.

One of the most popular and best known opalized wood collecting grounds is the great district on the north slope of Saddle Mountain, reaching from the small community of Beverly to some 25 miles east. A tremendous quantity of large and small masses of colorful opalized wood has been obtained here in the past few years and the locality continues to produce. Some of the areas appear to represent "rafts" of logs which were originally carried to one shore of an ancient lake by prevailing winds, or logs which accumulated at the mouth of a Miocene river.

Wood occurs on Saddle Mountain high up on the slopes at an elevation of some 2,000 feet above the highway, and much of the material which is found at the lower levels and in canyon bottoms was perhaps carried down from one of the upper horizons. A number of types of wood occurs at this locality, but the conifers are dominant.

An auto road leads up Crab Creek for a distance of 24 miles to the town of Corfu. From this point the road is steep and winding over the summit of Saddle Mountain. Near the summit and on the south slopes of Saddle Mountain there is also a profusion of fossil woods. The south slope is more difficult of access and much less collecting has been done in this area. Logs of beautifully opalized wood, as great as 6 to 8 feet in diameter, and weighing many tons, have been observed in the Saddle Mountain country.

Considerable opalized wood occurs along both sides of the highway leading from Ellensburg to Vantage, and in 1935 the State Legislature set aside a considerable area to be known as Ginkgo State Park. A portion of this area has been developed, fine large opalized trees have been exposed to view, and a museum and caretaker installed, for the benefit of visitors. No collecting is permitted in this area.

The Ginkgo Petrified Forest covers an area of some 7,000 acres, and it has been estimated that there are from 5,000 to 10,000 petrified logs within the park boundaries of 12 square miles. Professor George Beck, Department of Geology, Washington College of Education at Ellensburg, was one of the first to realize the importance of this region. It was largely through the work of Beck that the Ginkgo Petrified Forest has been preserved as a state park. He also was the first to carry on scientific studies in identifying the various woods found in this area. Considerable credit is due Professor Beck for his pioneer work and foresight. As an indication of the interest shown by the public in the Ginkgo Park some 60,000 visitors sign the register each year.

In the south central part of Washington, north and east of the town of Roosevelt, are a series of rolling hills known as the Horse Heaven Hills. The opalized woods occur here at various horizons. This locality has been a heavy producer and was first described by Dr. H. C. Dake in the May 1937 issue of The Mineralogist.

In Lincoln County, about 2 miles northwest of the town of Mondovi, there is a small low hill of vesicular basalt, forming a barren spot in the rich wheat land. Most of the vesicles of the basalt are filled with hyalite or hydrophane, with some fire opal. By breaking a quantity of this basalt a small amount of fire opal with a good play of colors may be obtained. The fire opal is wholly unsuited for lapidary purposes. Some years ago an attempt was made to work this locality on a commercial basis but the venture was soon abandoned.

*Common Opal* — Within the city of Spokane common opal in a great variety of colors has been encountered in construction excavations in the basalts. At an old rock quarry, at southeast Boulevard and 27th, some yellow and green common opal has been encountered. On a recent WPA sewer project common opal in a great variety of colors was found in the city. While leveling off a large rock mass at 3rd and Monroe Streets, clear white and colored common opal was exposed. Within the city of Spokane opalized wood has been found at numerous places.

From near Valleyford, 16 miles southeast of Spokane, large translucent masses of amber colored opal have been found. Some of this material is suitable for lapidary treatment. At an old rock quarry near the town of Belmont some fine colored opal and large opalized logs have been collected.

*Precious Opal*—The most notable find of precious opal was made in 1890, while digging a well, about 5 miles north of Pullman, and very near the Idaho-Washington boundary. Excellent fire opal was encountered in the vesicular basalt. This started an opal "rush" to the locality and several companies were formed to carry on mining operations.

In 1891 there was a production of over $5,000 from these mines. The mining of opal was carried out at three places, about 200 feet apart, in a triangular space. The house on the ranch now stands in the center of this area. Mining was done by sinking pits up to 20 feet in depth and several open cuts, but the venture did not prove profitable.

Dr. C. D. Campbell, of Washington State College, states that in May, 1940, a teacher residing near the precious opal locality brought in a slab of basalt showing beautiful fire opal filling the vesicles. This is said to be the best specimen coming from the locality in many years.

Near Moses, down the Snake River from Lewiston, Idaho, there is a prospect hole high up on the hill which is said to have produced some excellent fire opal. Also, below Lewiston, across the Snake River from Silcott, is another locality. About 900 feet up on the hillside is an old prospect hole. Lewiston collectors recently visited this old locality and found fragments of fire opal on the old dumps. A few small cabochons were cut from the material collected.

In the hills to the east of Yakima some excellent opalized wood has been obtained. To reach the locality take the Moxee City road 33 miles out of Yakima to a small bridge. About 50 feet west of the bridge is a dirt road leading to the left, which in about a mile reaches an old sheep camp. For a mile or more up a dry canyon excellent opalized wood has been obtained on the sage covered hills. Specimens have been found over a large area in this vicinity.

On Yakima Ridge, east of Yakima, fine specimens of opalized wood have been obtained.

*Cassiterite* — The tin mineral cassiterite, when found in gem quality, finds limited use as a gem mineral. Cassiterite occurs at Silver Hill, some 11 miles southeast of the center of Spokane.

*Brucite* — At the Keystone Quarry, about 12 miles west of Valley in Stevens County, is an exposure of massive brucite 40 feet in length and 20 feet thick. It is finely fibrous, very compact, translucent, and in various shades of green to white in color.

Some years ago this brucite was quarried and sawed into slabs for building purposes. It was also made into ornaments and turned into vases. The material takes a fine polish and is suitable for cabochon cutting.

*Spherosiderite*—Although this mineral has not been listed as a gem material, several local gem cutters have some beautiful cabochons in their collections. Perfect spherical masses of spherosiderite have been found in the basalts of Spokane during construction excavations. The mineral occurs as perfect spheres, from quite small up to two inches in diameter. Cutting is simple. The sphere is sawed, and two or more cabochons can be shaped according to the desire.

The cabochons are rather attractive, with the beautiful black metallic lustre. Held toward the light it is seen to be translucent, of an olive green color, with a dark spot in the center, somewhat of the appearance of an eye. The writer first cut cabochons from this material in 1934.

*Smithsonite*—At the Josephine Mine, near Metaline Falls, some superb smithsonite was found in the surface workings. A fine specimen of this can be seen at the Spokane Museum, equal to the best found anywhere and well adapted for lapidary treatment.

*Aragonite* — At the head of road in number 1 canyon, just outside of Wenatchee, there is said to be an abundance of glistening white onyx on the canyon slopes. Dr. C. D. Campbell reports that a student at the State College of Washington at Pullman brought in several specimens of this material.

West of Addy in Chelan County (about 15 miles) there is some brown onyx with a wavy banding.

*Malachite and Azurite*—The writer knows of no occurrence of gem quality material within the state. At the Loon Lake copper mine in Stevens County some excellent specimen material was mined.

*Pearl* — In the Spokane Museum there is an exhibit of 27 lavender colored pearls, collected by Walter E. Flowers from fresh water mussels along Tacoma Creek in Pend Oreille County. In size they range up to three-sixteenths of a inch; all are of a good spherical shape.

*Stucco Rock* — In Stevens County there are several deposits of highly colored limestone, dolomite, magnesite, and serpentine. These are intermittently mined and crushed at Chewelah and used for stucco work on buildings. The colors are pleasing.

*Beryl* — In a cut on the S. P. & S. Railway, just north of Fish Lake, near Marshall in Spokane County, a few beryl crystals have been found. They occur in a light colored pegmatite dike, but none were of gem quality.

In Stevens County, just above Kettle Falls bridge, on the east side of the Columbia River, about 10 feet above normal water level, is a pegmatite sill in the Kettle Falls quartzite. From the pegmatite C. D. Campbell, of Washington State College, collected several beryl crystals. The largest was pale blue and 2 inches in length, but not of gem quality.

*Garnet* — Various size garnets have been reported at different localities in Pend Oreille County, and in the granitic rocks near Sacheen Lake small stones are common. Good size garnets are reported to occur north of the Little Spokane River, to the north of Spokane. This locality would be in a region of granitic rocks.

*Vesuvianite* — About 7 miles northwest of Ione in Pend Oreille County on the Coffee Mine there is a crystallized white limestone with disseminations of galena and sphalerite. Some specimens of this material contain large yellowish green areas of vesuvianite. This observation was made by the writer while at the locality in October 1936.

*Andalusite*—The compact ore from Silver Hill, carrying cassiterite, sillimanite, and andalusite, takes a good polish, and has found limited use for lapidary purposes by local cutters.

*Thulite* — To the north of Riverside in Okanogan County the pink variety of zoisite (thulite) has been found. At one time a company was formed to work this deposit as an ornamental stone. This material takes a good polish and could be utilized for cabochon cutting and other ornamental purposes.

*Dumortierite* — At the headwaters of the north fork of Washougal River in Skamania County there is a fine grained light colored rock composed of muscovite, andalusite, and dumortierite. The dumortierite occurs in a new habit in small blue spherulites up to 3 mm. in diameter.

*Tourmaline*—Small crystals of tourmaline have been found at various localities within the state, but little or none of this material is suitable for gem cutting. The largest and best tourmaline crystals known to the writer as occurring in the state are on Mica Peak, about 25 miles southeast of Spokane. The Crystals occur in sizes up to 2 and 3 inches in length and are black in color. They occur in a pegmatite and are found loose in the surrounding debris weathered from the dike.

*Serpentine* — Suitable as an ornamental stone occurs in various parts of the state and has been quarried as such at several localities. Some of the precious variety is suitable for lapidary purposes. The most outstanding locality in Stevens County is the old U. S. Marble Quarry, now known as the Keystone Magnesite Quarry. At this locality, about 400 feet of the magnesite and brucite quarry, there is a serpentine quarry presenting a peculiar type of rock. It is not a true serpentine, but resembles serpentine in green color, and was named pseudoserpentine by Clarke.

The pseudoserpentine was quarried and sawed into blocks for building purposes some years ago. It is well adapted for lapidary work and ornamental purposes. The late George Kunz in one of his reports of 1905 mentions this material as a "handsome serpentine of unusual character." He also mentions that this material was exhibited at the Buffalo and Charleston Expositions.

*Talc*—Is too soft for cabochon purposes, but often finds use for carved ornaments, hence a few localities will be given here. On the north bank of the Skagit River, about 2 miles above Bacon Creek in Skagit County, talc was found by prospectors some 40 years ago. At the present time the deposit is being worked by the McMyrle Talc Mines, and considerable work has been carried out. The talc is quarried in large blocks and sawed with silicon carbide wheels into various size slabs for various industrial uses. The paper industry uses large quantities. The compact material is suitable for carving into ornaments.

There are also several other talc deposits in the region referred to above.

*Chrysocolla*—From Keller in Ferry County chrysocolla mixed with chalcolite has been found in the metal mines. The combination of black and green makes a pleasing appearance, and some of this material has been cut and polished and marketed to a small extent as "cuprous gems."

### Saddle Mountain

The Saddle Mountain region of Central Washington has perhaps produced a greater quantity of colorful opalized wood, than any other similar region in the United States. Considerable collecting has been carried out here for a number of years, but the area is so large, and each year weathering exposes new material, the locality still continues to yield in quantity as well as quality. Much of the opalized wood found here is well-suited for lapidary treatment, including large objects like book ends. Enormous logs, far too heavy to move, are often encountered. The locality can be reached from the west via Ellensburg, and from the north via Spokane. From the west, Gingko State Park Petrified Forest will prove worthy of a stop for a few hours. Huge opalized logs have been excavated from the lava for the benefit of visitors. The purpose of this museum is mainly to exhibit specimens found in the Central Washington region. Some superb polished sections will be seen here. The work of cutting and polishing is carried out in the shops of the Museum. At number three will be found cabins for tourists, and a convenient place to stop for the night. Vantage Bridge crosses the Columbia River here; turn south on a dirt road to the little community, number four, of Beverly. It would be wise to make local inquiry here. The gas station is operated by a collector, and a refreshment station is also close at hand.

From Beverly, Saddle Mountain will stand out as a huge sage-covered mountain, rising above the surrounding country to an elevation of 2,000 feet or more. You can not miss it. The opalized wood is found on the slopes of the mountain. Much of this land is "open range" country, hence there can be no restrictions on collecting.

Saddle Mountain extends in an east and west direction for some 10 miles or more. Most of the collecting has been done on the north side which is most readily reached by the highway. Much of the wood is found in the dry washes which extend down the north slope to the highway. In prospecting these ravines, small fragmentary material will be found in the lower reaches, and as altitude is gained larger specimens will be forthcoming. Often a large specimen will be exposed at only a small corner, so investigate all outcroppings. The sloping sides of the ravines are also productive.

The opalized wood of Saddle Mountain occurs in seams of sedimentary (volcanic ash) material deposited between the flows of Miocene lavas. All material found in situ will be in or closely associated with these sedimentaries. The light colored sediments represent lake sediments. During the long periods between flows of lava, shallow lakes formed, and a forest grew along the shores. Fallen trees would find their way into the lakes, and the prevailing winds would carry the drift wood to one side of the lake, where it would finally become water-logged and sink. The final destruction of the standing forest would be marked by the onset of volcanic activity, often starting with heavy showers of volcanic ash. During middle Miocene, some 15 million years ago, when these forests thrived, the climate must have been warm and moist as proven by the great size of some of the opalized logs. Five and six-foot diameter specimens have been encountered.

Little collecting has been done on the south slopes of Saddle Mountain, as this region is some distance from the auto highway, and can be reached only by foot work, which also means that the heavy specimens must be carried out. A stout pack sack will be found handy, in addition to a light pick and shovel. Where a heavy log is found on a hillside, it is often possible to place same in a potato sack, attach a rope at each end of sack, and two men can roll the log down to near the highway.

Saddle Mountain is an isolated region as far as civilization goes. There are few residents here, but their cattle and sheep grazing in the hills should not be disturbed. In most of these great western collecting regions collectors will be welcomed until they begin to discharge firearms and fail to close gates. Gunshots may cause a stampede and open gates will allow the stock to drift far and wide. Observation of these reasonable

Some rim rocks and talus slopes in the Saddle Mountains of central Washington. The huge opalized logs, described by Bateman, are frequently found outcropping between layers in the successive flows of lava. The Saddle Mountains cover an area extending some 25 miles east and west, by about 10 miles north and south. This locality has been productive of colorful opalized and agatized wood for many years. A good road extends along the north side of the range.

rules will mean these great western regions of "open range" will remain open to the collector forever.

A pleasant vacation of several days or more may be spent at Saddle Mountain, far from the noise and hurry of the busy city. Camping spots are numerous — but do not build a fire near dry grass or sage.

### Moxee City Area

Excellent opalized wood has been found in the hills east of Yakima, Washington. To reach the locality take the Moxee City road about 33 miles out from Yakima, to a small bridge. About 50 feet west of small bridge turn left and follow dirt road about one mile to old sheep camp. Auto can be driven to old sheep shed.

Excellent opalized wood is found for a mile or more up the dry canyon adjacent to sheep camp. Specimens are found on the sage and grass covered hills. Some good logs are reported.

### Red Top Mountain

The locality known as Red Top Mountain is one of the newer localities in Washington. It has been publicized only the past few years, and comparatively few have visited this region, and little field work has been done. From the reports of those who have visited this region, it is expected that Red Top Mountain will in the future develop into one of the best gem producing regions in the state.

Red Top Mountain can not be reached by auto, the visit will require foot work, including about two miles of a rather steep uphill foot trail. This alone will likely preserve the locality from excessive exploitation for many years to come.

E. S. Bateman, 5108 West Olga Street, Seattle 6, Washington, has visited this locality a number of times, including trips soon after its discovery. Bateman gives us here an excellent description of a visit to Red Top Mountain.

One look at a rich, deep, velvet blue gem, set in a ring, and the writer knew that never again would he have peace of mind. He must forthwith go, and never stop searching until he found agate of this color and quality. In this wise the famous Red Top blue agate cast its spell over another willing victim, who went the way of all gem hunters on the trail leading to the ridges of Red Top Mountain, to Dry Creek and the adjacent areas.

The trip to this locality can not be carried out effectively in only one day, so the "Agate special", that tried, and true old reliable, was readied and loaded with camping equipment and tools.

With Johnny Fuller, the writer's son-in-law, setting along side, and all agog with interest on his first gem hunting expedition, before daylight we headed the Agate Special eastward from Seattle. With practically no other traffic we were soon well out of the city, by daylight, and settled down to the steady pace of 40 per, which the old Agate Special just loves. Soon we were in the wild and rugged scenery of the famous Snoqualmie Pass, that disects the Cascade Mountain range. Down the east side of the range and past Lake Kecheelis, the old Agate Special spun along, gasping in the cool mountain air to ease her aching lungs.

Leaving the lake's wavelets dancing in the sun's newly risen rays behind us, we descended into the valley leading to Cle Elum, fortified by a quick breakfast, we hastened on. Soon we turned left onto highway 97. We stopped at the Liberty Forest Ranger Station, for fire permit and instruction regarding camp fires in the U. S. Forest Reserve.

Then up the valley, passing old settlements, the spinning wheels of the Agate Special carried us along Swauk Creek. Observing a large metal framework along the creek, our curiosity was aroused and we stopped to investigate. This old mass of metal proved interesting, for it was one of the gold dredges that was used many years ago to recover the placer gold from the creek. When the gold bearing gravels were exhausted the dredge was left standing where it is today. Huge windrows of rocks and gravels attested to the past activities of this gold gathering machine. It has been more than 20 years since the last dredge operated here.

An interesting story is told in connection with these gold dredges which we may repeat here. One day a lady visitor watching the dredge in operation wandered around over the huge piles of rock and gravel behind the dredge. She suddenly spotted an unusual yellowish rock, and ran to her friends exclaiming, "See what I found, what kind of a rock is this?" She had found an enormous, large gold nugget, worth some $400. The gold specimen was too large to pass through the revolving screen along with the sand and smaller nuggets, hence it was cast out on the dumps along with the larger gravels and boulders. Doubtless many large gold nuggets were lost in this manner, for in the ground along Swauk Creek gold nuggets weighing several ounces were common, while a goodly number of still larger ones were recovered by the dredges, but how many huge masses were dumped out with the waste and covered, is a matter of interesting speculation.

We soon reached Mineral Springs Camp, where road and other information was cheerfully given to us. Shortly after leaving Mineral Springs, we turned left on Medicine Creek road (see sketch map), and after several miles we parked Agate Special at a convenient spot along side the road.

It is possible to go by auto some distance up the grade, but it is steep and rough going, so we decided not to put faithful Agate Special through this punishment. So on foot, and loaded down with our camp equipment, we climbed steadily for about a mile, when we came upon a stalled car, and found our old friend, C. H. Fulmer of Seattle, and fellow member of the Gem Collectors Club.

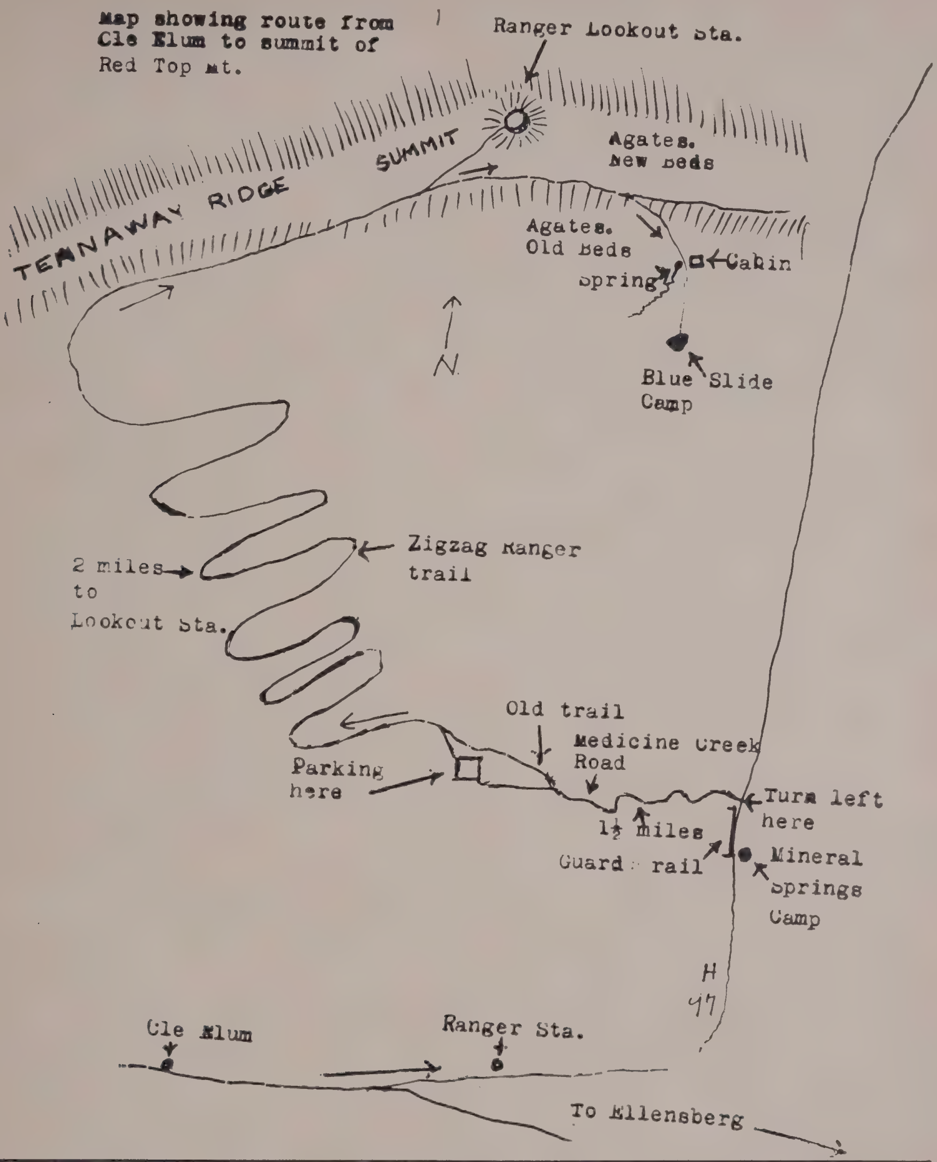
Following the Blue Creek trail, always taking the right hand turns, we finally arrived within sight of the forest ranger's lookout station. Passing along what was now level and easy going, compared with the steep trail behind us, we made good time. On both sides of us were agate fields that have been worked over by collectors from time to time.

At the first right hand fork (see sketch map) we paused to rest. Soon Fulmer and his party came down from above, where they had been exploring the new agate beds. They were not empty-handed for they brought out some fine looking nodules, and geodes that were most excellent, but after all the amount one man can carry out is limited, and he will not be likely to make more than one round trip the same day. With this in mind, this is an area that will require a long time to deplete.

Taking the right hand trail, we came almost at once to an old log cabin hidden away amongst the big trees and brush, and noted the sign on a nearby tree directing to what is probably the only water near Red Top summit. We found this spring water sweet, pure, cold and refreshing after our long pull up the grade.

Unfortunately, as is often the case careless campers and vandals had nearly wrecked the interior of this fine little cabin, to say nothing of the litter of rubbish strewn about. It did not take us long to decide to abide with Nature outside and in the comfort of our G. I. sleeping bags, leaving the cabin to the pack rats that infested the interior.

In the morning, after a refreshing rest, we struck out for the diggings. A steady pace carried us high up to a mountain meadow, on the edge of which was a recently used and large campsite. The agate beds here cover a large area, with signs of former gem hunters all around us. Many small shallow diggings were in evidence, geodes broken open, and fragments everywhere.



Testing old workings and exploring new spots, we finally worked down the slope of the ridge top on to new ground, where we filled our packs with nodular masses, looking much like sweet potatoes. We did not find any large geodes or agate masses, such as Ralph Gustafson of the Seattle Gem Collectors Club packed out and exhibited at the Seattle Convention in 1947. But, had we stayed longer and tried other spots we probably would have obtained similar large and fine masses as Gustafson had obtained.

Our original plans were to prospect both the old beds below the trail, and the new beds on Teanaway Ridge, where we were now digging, but continued rains and wind made digging and walking unpleasant. So we finally decided we had gathered enough of the fine blue agate nodules, and longing for the solid comfort of Agate Special, we decided to leave. Although our packs were heavily loaded with booty, the return trip was all down grade, and comparatively easy, all we had to do was lift one foot, drop it down in front of the other, gravity doing the rest.

At this locality there is a great area that still remains unknown and unexplored, and in all probability future gem hunters will find many additional spots. While many have visited here, the physical difficulties are such that no one man can remove much in one visit, or is he likely to climb to the summit more than once at day. Moreover, it is not possible to drive in with a car or truck. With this in mind it will doubtless be a long time before the locality is "depleted", if ever. Owing to the high elevation, snow covers the ground much of the year, and this serves to limit the collecting season.

During July and August weather conditions are likely to be quite pleasant in the coolness of the high mountains. The proper way to work this locality, would be for a party to set up a permanent camp on the ground, bring in enough supplies, and remain at least a week or longer. An ideal vacation could be spent here on the Public Domain of the Forest Reserve. The only rules and restrictions pertain to using due care and caution with camp fires. The Forest Reserve officials have no objections whatever to rock hounds or gem hunters, but carelessness with fires, matches and smoking will bring swift and severe punishment, and quite justly. Our forests are preserved and protected for all to enter and enjoy — free of all cost and entrance or camping fees, come and stay as long as you like.

There is another way one may reach this fine locality, in a less strenuous manner. One may hire pack and saddle horses, or pack horses may be rented to bring in supplies and pack out the heavy specimens. The Forest Rangers in this region can supply information pertaining to where horses may be obtained. A party of prospectors, remaining a week or longer would no doubt gather hundreds of pounds of fine gem material and specimens, pack horses would come in handy. The average pack horse can handle about 175 pounds at a load, and possibly a little more on down grade, and for short distances.

Red Top Mountain summit is partly made up of the Teanaway basalts, which are lava flows with interbedded tuffs. The lava is black and quite vesicular. In portions of the basalts these cavities are often quite large, and it is in these cavities that the percolating waters deposited both the fine solid blue agate, and the superb quartz crystal lined geodes. How long it took Mother Nature to deposit these gems no one knows, and your guess is as good as mine, but doubtless it took eons of time. Then another long period elapsed to allow the elements to do their destructive work of decomposing the lavas, and release the specimens. Since quartz and agate are far more resistant to weathering than the mother basalt, we find the specimens loose on the surface, or at shallow depths in the surface debris.

Just before dark we reached our waiting Agate Special, stowed our gear and specimens, rolled out onto the highway at dark. After several idle days Agate Special seemed restless and champing at the throttle so we gave her more gas and rolled along faster than our normal pace of 40 per. At Cle Elum we stopped to see the fine collections of Frank Bobo. Frank is a pioneer rock hound and has long operated gem cutting equipment. No rock hound passing through Cle Elum should fail to meet genial Frank and view his extensive collections, which are especially rich in local materials.

Red Top Mountain locality provides a short trip combining all the features of adventure, hope, and scenic grandeur. There are perhaps few spots in the Country where the gem hunter could enjoy a more pleasant vacation, combined with the possibilities of collecting fine materials.

By no means is every agate nodule found of the fine, deep, cornflower blue color. Fine blue agate is comparatively rare at any locality in the country. Some of the specimens are lacking in colors, while others carry only a faint tint of blue. Only a small percentage of the nodules will prove to be of the finest quality blue. Usually this can be determined in the field by carefully chipping off a small corner, with a light weight square-faced hammer. The experienced collector, skilled in the use of a light square-faced hammer, is not likely to damage an otherwise fine specimen. It is to be noted that in breaking off or trimming off small corners from a specimen, the square-faced hammer is much more effective than any standard round-faced hammer. This is why geological rock picks usually have a square-faced hammer on one end. A light, square-faced hammer will also be found quite useful in trimming off rough corners, or surplus matrix material, from almost any type of specimen material.

There is one other notable blue agate locality in the United States, that of the Mojave Desert region in California. While the California locality has produced fine blue agate, the best does not equal the best from Red Top Mountain in Washington.

The writer has made use of that excellent Mount Stuart folio of the Geological Atlas of the United States. He also wishes to thank the following individuals for their courtesies and helpful information: Frank

Bobo of CleElum, and Charles E. Grupe, C. N. Clinesmith, Peter Tjosem, and James H. Reese, all residents of Ellensburg, Washington.

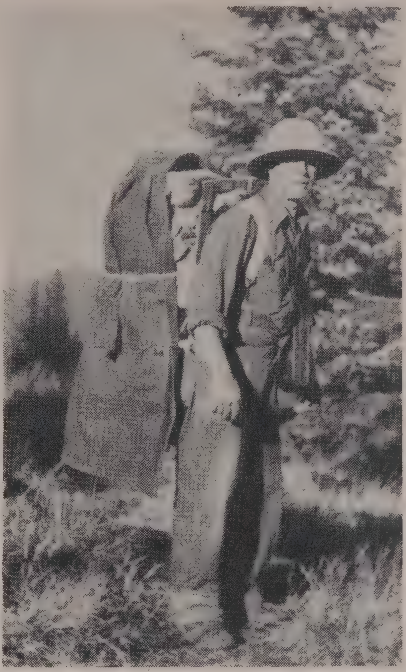
### Riverside Locality

One of the little known localities in Washington, is in the region around Riverside, in the Northeastern part of the state, and not far north of the world famous Coulee Dam, rated as among the largest structures ever built by man. In this same region are a number of old mining camps, notably the Republic Mining District, which have produced a great variety of fine mineral specimens. It is not within the scope of this booklet to describe the mining districts, but good mineral specimens may be found on many of the old mine dumps.

There are numerous pegmatite formations in the Riverside area, and in these formations the gem hunter may find a host of gem minerals. Practically no field work has been done by gem hunters in this region. Major Arthur Dysart, with the U. S. Bureau of Reclamation at Coulee Dam, has given us a most excellent description of the Riverside region, his paper and sketch map appear below.

The region in which plutonic intrusions lie in close contact with some of the complex formations of older periods, offers a field for exploitation by the mineralogist and specimen hunter. Also the topography of such areas promises the interesting and unusual variations to the observer of nature's landscaping. Such a region may be found a few miles to the north and west of the small community of Riverside, Washington, which is about 40 miles from the north-central boundary of the state, and where the altered and shattered granitics of the Mesozoic border the old rocks of eruptive origin together with the re-crystallized and deformed sedimentaries of the Paleozoic. Riverside is situated on U. S. Highway No. 97 which traverses the Okanogan Valley. The valley itself is remarkable as it has structural relations to the outcrops; therefore some features of the valley and the general area are herein first described.

Okanogan valley has been used by Fenniman and other authorities as the boundary between geological provinces—the Okanogan Highlands eastward and the Northern Cascades westward. Undoubtedly the valley was an ancient channel which separated unlike physiography at an early period. In this valley, about 36 miles south from Riverside, the Okanogan River joins the Columbia River. Above the junction the valley of the Okanogan however, is lower in elevation and broader than the respective features of the greater stream. Moreover, the rate of fall of the former stream is only about two-fifths that of the Columbia immediately upstream, though below the junction, the fall of the combined streams is somewhat the same as that of the smaller; so that one may say that the Okanogan picks up a greater river in its course southward. Both streams are deeply trenched.



E. S. Bateman at the summit of Red Top Mountain, with pack of supplies and prospecting equipment.

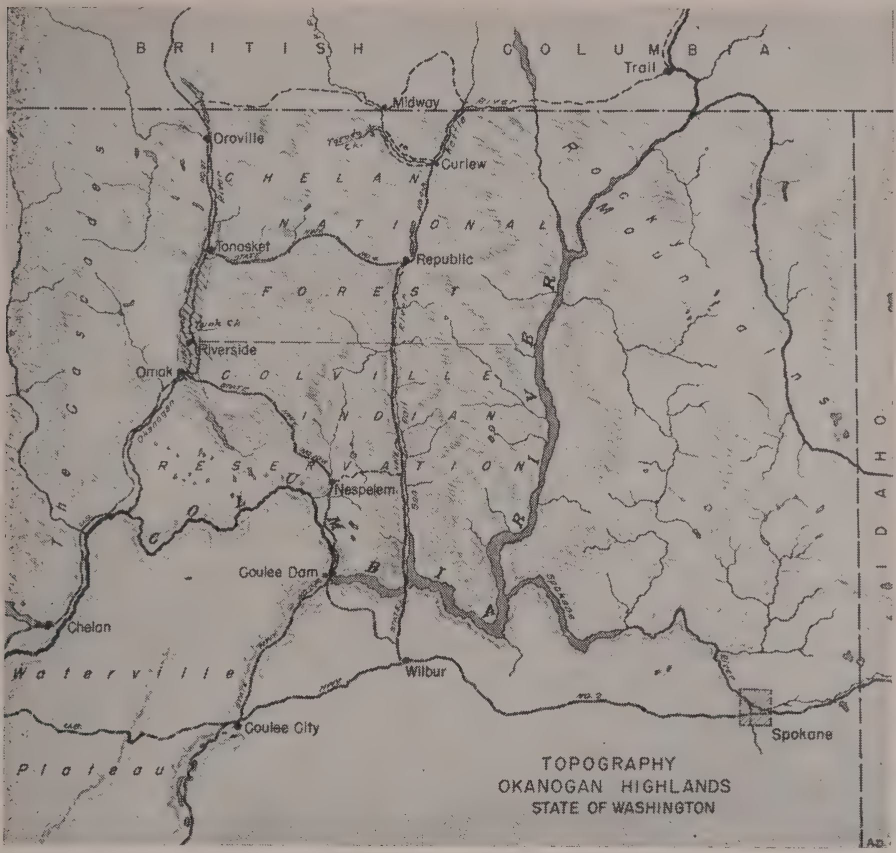
Within the geological calendar the Okanogan lobes of cordilleran ice in the more recent ages have plowed the valley by that name and swept the general areas leaving plenty of evidence for observation, however hasty, of today. But there is also evidence of earlier and important happenings, which serves to delimit the western part of the Okanogan Highlands. In a former epoch cataclysmic events of great magnitude locally took place, though the effects extended southeast and probably made it possible for a later change in the course of the Columbia. The last of the dynamic changes was a faulting which may have been determined as occurring at a known time, probably the Tertiary, though it would be difficult to determine definitely when the last of the intermittent quakings came to an end. The lines of the faulting, as seen at the present time, are more noticeable on the east side of the Okanogan valley than on the west side. The general traverse of the system is clearly visible in the sketches southward along the river from points near Tonasket or about 20 miles to the north of Riverside, and extending to the lower Okanogan — here and there marked by unusual canyons and offsets. South of Tonasket is the McGloughlin canyon, the walls of which reveal a startling display of small and large tension cracks across the flow lines of the metamorphic rock which borders the batholith of the Okanogan Highlands. That freezing and thawing had a great deal to do with the enlargement of cracks and changes radically structural profiles, is apparent; however, it is not so easy to explain the basic causes of the greater canyon-making displacements which are revealed in the hills bordering the Okanogan. Mentioned by some authorities as a zone of gigantic brecciation, the valley is fallow ground for the stream changes—which the laymen may recognize. The trunk line of the trenching with all of its arborescent attendants generally coincides with the valley, but at a point seven miles south of Riverside there is a diversion of at least an arterial branch which trends southeast — passing through the Omak Lake depression. At Coulee Dam, situated on the Columbia some 50 miles from the Okanogan, the same general strike of minor trenching may be seen in the granitic outcrops. Some remarkable features in this chain of faulting are the open gaps, or through-canyons. The width of these canyons, though fairly uniform in each case, varies appreciably, and appear as ice channels in some cases. Generally the canyon is formed by a singular east-facing vertical wall, escarpment like in the degree of slope to the opposite wall. Also in the general case, there is a remnant peak on the west side with some indication of lateral movement. The canyons occurring through the summits of the higher spurs have floors, often containing small lakes. No doubt the movement of the extinct glaciers has done much in the shaping of profiles. Talus and unconsolidated accumulations at later date have also done their share of shaping, by filling in the bottoms of the depressions.

The two canyons which have unusual appeal are McGloughlin Canyon and the commonly called Tunk Creek Canyon. McGloughlin Canyon is not so much a gap daylighted straight through as it turns in direction and is connected with a boxed canyon modified by drainage. It is floored with a primitive and wooded area which adds much to its scenic attractiveness. Tunk Creek Canyon, located six miles north of Riverside, is somewhat smaller—being about three-quarters of a mile in length and having a wall height of from three to four hundred feet.

Tunk Creek Canyon is more common to the type as it has no relation to any drainage system of the present and has a single abrupt wall. The Tunk Creek county road traverses this canyon, passing above the narrow floor which is choked with coarse talus. An excellent opportunity is offered to closely observe the singular wall, one which presents a most composite assortment of metamorphic and non-metamorphic formations. The emulsification are of cold solids for there are many interstices and misfits of the rock, forming the face where also occur dikes, sills and crumplings, emphasized by the light and dark color of the material. Gneiss and schist makes up the greater part of the dark while the extreme light color is due to the feldspars, quartz and muscovite. The small cavities to be observed in the canyon, in neighboring cliffs and in a railroad cut within the vicinity, may be noted as unusual for not all of them appear to have been caused by weathering or percolation.

Skirting to the north of Tunk Creek Canyon is a small creek which bears the identifying name, but such is one which could be changed characteristically to "Hornblende Creek." The creek's stream which cascades several hundred feet in its fall within two miles appears to have carved its channel out of the massive beds of hornblende schist and chlorite. However, as might be expected, in the typical stream of the region, there are short stretches strewn with boulders, gravel and sand as well as some banks of the Quaternary glacial silts. The hills to the north of the Tunk Creek have little vegetation except for sagebrush that are weathered to a common rolling terrain and the numerous outcrops thereon reveal more hornblende schist and chlorite jumbled with porphyritics and which is assembled both horizontally and vertically.

But it is the crystalline textures, the alterations to the hornblende rocks, the associating minerals, and the inclusive veins, dikes and seams in this area which should awaken the keen interest of a rock-lover. Much of the quartzite veining is tinged with the pale pink of thulite. The deeper color of rhodonitethulite variations show occasionally in the creek bed. Pink streaks and spots may be found in the broken rock in



scattered locations on the surrounding hills, in the canyon and in the railroad cuts. Some of this colored material is of the choice grade when considered as an ornamental stone, and is may be found occuring with zoisite and epidote rocks and with variable green bandings of about the same hardness. Though not of gem quality, small crystals of epidote, tourmaline, actinolite, pectolite and the zeolites may be found. Small books of tough chrome green mica, probably prochlorite, occur in the railroad cut hereinbefore mentioned. The recent statement of Dr. Alexander N. Winchell (of Yale) that 17 different minerals now considered as separate should be included with amphibole—may be appreciated by any student visiting such an opportune field.

In the walls and talus of the canyon of Tunk Creek occur small crinkly massive, rather friable but clear quartz, also muscovite in flakes of considerable size—the latter sprinkled with minute garnets. Common in the pegmatites are thin biotite leaves which occur more like platings rather than in book form Crystals up to three-quarters by four inches of the shor variety of tourmaline have been recovered from a few of the stones which have scaled from the higher locations. These crystals are remarkable in that many of them have sharply pointed pyramid crudely joined at a thick middle. Commonly located at one end of these larger crystals of tourmaline are the bush-like gatherings, or swarms of smaller crystals of the same mineral — sometimes minute clear red and flat crystals of garnet making up the swarms which are about 1 inch in diameter. The soft alkali feldspar, which contains the tourmaline crystals is seamed with muscovite and crenulations of quartz. Within the compass of a single hand specimen of this material, garnet, biotite, muscovite, tourmaline and possibly quartz seem to grade insensitively from one definite mineral to another—which fact makes identification so difficult. Too much has not been written on the subject of associations and alterations. On a boulder in the bed of Tunk Creek, the author has located a single large zeolite crystal of considerable beauty. The pink-tinged crystal, about 8 inches across and less than half an inch in thickness, has been carefully measured and photographed in

Local Specimens of great beauty are on display at the museum of Gingko State Park, near Vantage, Washington. The collections are rich in superb and large polished pieces of local opalized woods.

color. It would be extremely difficult to remove such a fragile form from the parent rock which has cleavage planes normal to the flat side of the crystal.

Probably there are many other minerals yet to be located within the general vicinity of Riverside. Immediately west of the village a small dolomite limestone quarry is in operation, and further to the northwest some small abandoned exploitations in the old formations may be observed. As in other regions, miners were among the first settlers and were those whose chief interests were the precious metals. Later there were those who were also interested in copper, lead and zinc, but all passed over the nonmetallic minerals and their wonderful crystals which are so diligently sought today. The area around the small village in Washington should be on a preferred list of locations for students and prospectors who seek variety in specimens. Farther south, in California, a location famous for having possibly the greatest number of classifications, bears the same name.

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NOTE — During the past year, several privately owned localities in the Pacific Northwest have been opened to diggers for an entrance fee. In some instances this fee is based on poundage dug, while in other properties a flat per day digging fee is charged. These localities are usually grounds that are well known as good producers of high grade gem materials, usually agate and thunder eggs.

The proprietors usually work the ground over with power machinery to enable the digger to more readily obtain the rough gem materials. In general this method has worked out quite satisfactorily. Strangers are enabled to readily reach good hunting grounds, and with a minimum of time and effort, usually obtain a quantity of good materials at a reasonable cost.

As these commercial diggings are opened from time to time, advertisements of same may be noted in *The Mineralogist Magazine,* and other journals in this field, stating locations, fees, and other pertinent details.

# Idaho
## The Gem State

Idaho has long been known as "The Gem State", a claim no doubt fully justified, for there are numerous excellent gem deposits within Idaho. Aside from the work of E. V. Shannon, in his "Minerals of Idaho", comparatively little has been written regarding the gems of Idaho. E. V. Shannon was not primarily interested in gem minerals, but along with his mineral descriptions, he did include many notable gem localities. His book "Minerals of Idaho" is an early U. S. National Museum publication, and unfortunately it has long since been out of print, and is now regarded as a rare item — hard to get.

In all probability some notable gem discoveries will be made in Idaho in the future, along with a more intensive search for same. Some high grade uranium minerals have been found in the gold placers of central Idaho, and those who visit this part of the state may do well to keep this in mind. These uranium occurrences are described and illustrated in *Handbook of Uranium Minerals,* by DeMent and Dake.

### Silver City

While not primarily a gem locality, this area has produced a number of fine gem minerals, including agates in the creek beds, and amethyst in the lode veins. Silver City is a typical ghost town, and one of the few that remains more or less intact, having escaped the usual fate of fire and vandals. At the time the writer last visited Silver City, it was still the County seat of Owyhee County, and boasted a permanent population of about 35 persons. Several years past the County seat was moved from Silver City, and since then the permanent population has shrunk to less than a dozen persons. Both the mineral collector and the gem hunter will find much of interest in the Silver City region.

One of the best vacation spots we know of in the Western states, where the collector may visit, is the old mining town of Silver City, Idaho. This locality, high up in the mountains is off the beaten path, but may be readily reached by auto. There are two routes of entry, one by way of Boise and Nampa, and the other via Caldwell and Homedale. We advise the latter route, as the grades are not as steep, and some good collecting may be done en route.

The route via Nampa includes some steep and narrow mountain roads, that will frighten the motorist not accustomed to mountain grades and travel. Once you reach Silver City, you will find a peaceful little community of a few dozen residents, in a town which once had a population of some 5,000. Silver City is a typical western "ghost" town.

In the 1870s, Silver City was a fabulous producer of silver and gold, for gold being mainly in the form of electrum, carrying about 12 per cent gold and the remainder silver. The many mines at this locality produced a host of very rare silver minerals, some being found at no other locality in the world.

Standing on "Main Street" in Silver City, one can see two prominent hills, close at hand, War Eagle Mountain and Florida Mountain. On these high and barren hills can be seen hundreds of huge waste dumps, and thousands of small pot holes and open cuts. It is on these old dumps where the best collecting will be found. Some of these dumps are so enormous that they will provide good collecting spots for many years to come. A collector could spend months and months at this locality, and still never hope to visit all the collecting sites.

Nearby Silver City, is the old camp of De Lamar, also a good collecting ground. To the south of Silver City are additional old deserted mining camps, which once poured forth fabulous riches. In its hey day, the ores were so rich, that anything assaying less than about $100.00 to the ton was considered worthless and was cast over the dumps. For this reason the collector will often encounter fine rich silver ore specimens in the old dumps.

It is not necessary to hike a long distance to do good collecting at Silver City. There are many old mine dumps right in the heart of the "city" that can be reached with ease. Most of the old mines have been inactive for many years, and there are few, if any, restrictions placed on the collector. There is a tunnel under the old Idaho Hotel, which leads into a considerable working. This old portal was used as an ice box for many years by the hotel.

One of the best spots to collect, and only a few hundred yards distant, is the gulch leading up the south side of Florida Mountain. There are dozens of enormous dumps in the gulch, all of which yield superb crystallized gangue minerals, along with an occasional rich mass of rare silver minerals, and sometimes a fine specimen of crystallized electrum. In a small prospector's tunnel on the south side of the gulch, the writer found large and superb groups of valencianite, equal to the best in the world. The rare silver selenite, naumannite, is comparatively plentiful on the dumps in the gulch. If you feel equal to the task, you may climb up the hillside, and prospect hundreds of smaller dumps and old workings, but there is plenty at hand without any strenuous effort.

Most of the gangue materials on the old dumps is comprised of various feldspars and quartz, these are frequently snow-white in color and make very attractive cabinet specimens, especially when the specimen happens to be shot full of pyrargyrite, naumannite, argentite, or perhaps the still more rare proustite. One of the finest gangue minerals found here is the remarkably beautiful cellular calcite. Unfortunately this material is quite fragile, and not many of the fine ones survive when cast over the dumps. Quartz crystals in fine groups are common to Silver City, usually the crystals are not of large size, but they are generally of high quality.

There are many interesting sights to see in and around Silver City, in addition to the old mine workings. When you see the graveyard perched high up above the surrounding country you may wonder why. In the early days the Chinese placered the ground around the graveyard. They offered to move the graves and pay each of the heirs a fancy sum, but the offer was refused, so they worked all the ground around the graveyard. Millions in placer gold was taken out of the small area on the slopes of Florida Mountain.

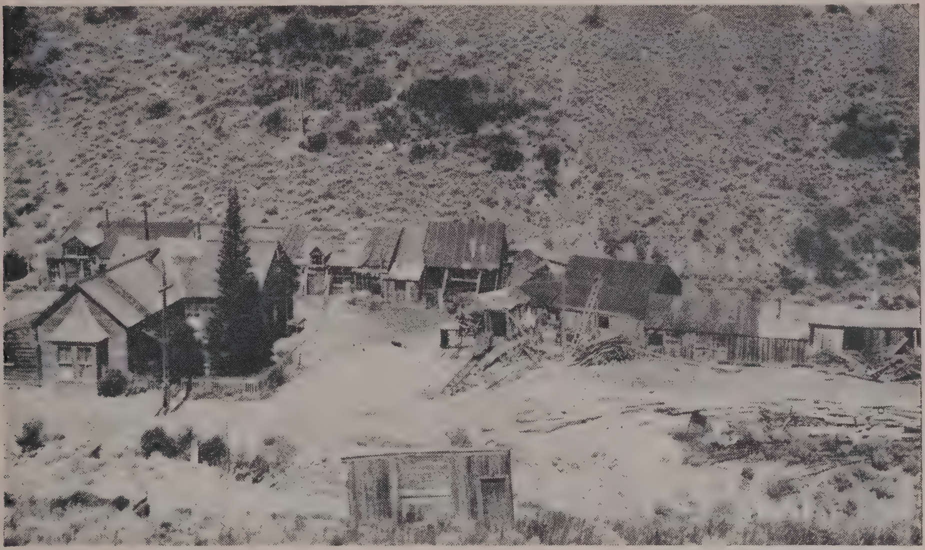
Down in the creek which drains the Silver City region you will find various minerals, including some cutting and polishing material, and perchance a few pebbles of water worn cassiterite. Another strange sight is the old abandoned mining machinery, scattered throughout the region. Old style Corliss steam engines, used to hoist the ore. Pumps and other equipment that dates back to 1870. All of this machinery was brought around Cape Horn by sailing vessels, unloaded at San Francisco, brought by rail to Winemucca, Nevada, and then the final 175 miles to Silver City, by mule team. Ore to be sent to the smelter was taken out by the same route, so we can readily understand why ore assaying less than $100.00 a ton, was considered worthless.

Fine quartz crystal lined geodes are found on the north slopes of War Eagle Mountain. We recall asking an old timer direction to the geode locality. "Never heard of them," the old timer replied. He persisted in his statement, and having resided there for over 40 years he became testy when we implied he did not know the country. Finally we took a specimen out of the car to show him what we had in mind. "Oh, you mean *gayodes,* yes I can tell you where to get em."

We collected pale colored amethyst crystals on some of the dumps on War Eagle Mountain, but nothing in the way of gem cutting quality. Among the many mines of War Eagle Mountain, the Poorman, was fabulously rich. For its size, this mine was the richest silver mine ever known, the workings were comparatively small and extended to a depth of only a few hundred feet. Masses of pure solid pyrargyrite ("ruby" silver) were encountered, and one weighing over 500 pounds was shipped to the Paris Exposition for display. We saw in the collection of an old timer (yes it was high graded in 1874) a specimen measuring about 4x5x6 inches, and made up of alternating seams of ruby silver and pure electrum. Some of the veins of electrum were a half inch thick. We tried to buy the specimen, but it was not for sale, and was valued at $475 00 in gold and silver alone.

In the old days, high grading on the part of the miners was quite a problem. Often the miner would carry out in his pockets, samples of a value much greater than his day's wages, but despite this wide high grading, the workings were so rich that the owners received millions in dividends. When a very rich stope was encountered, it was customary to place a miner here to work the vein by hand labor. It was customary to select a miner convalescing from an injury, so the stope was termed the "hospital stope". A large canvas was spread out and the miner would work slowly and carefully with chisel and hammer, and under the eye of one of the owners or trusted foremen. Ten or 20 pounds of ore chipped out in a day's work, might be worth hundreds of dollars, even if a few select pieces went into the miner's pocket.

While visiting at Silver City in 1930, we were fortunate to meet and talk with the discoverer of Silver City, John Stoddard, who was then around 80, and had not been on the "outside" for some 35 years. Stoddard with his two partners was driving



Lower portal of the noted Trade Dollar mine, on the south side of Florida Mountain, about one-fourth mile west of Silver City. The lower tunnel (center of photo) once lead through over 30 miles of workings. It was once possible to pass through Florida Mountain to Delamar on the north side, a distance of some six miles. The huge waste dumps (not shown) are to the right. The finest cellular calcite and valencianite, found anywhere, was once taken from these workings.

horses through what was to become Silver City later. He was camp cook, and one morning he built his fire against a rocky cliff. Later in the campfire ashes he saw a white shiny metal, which he knew was silver, from his past experience in the mines of Colorado.

Stoddard and his partners did not realize the value of their discovery, but they did file their claims. Finally one partner sold his interests for a team of horses and a wagon, the others also realized very little from their discovery. This mine later became the famous De Lamar, which brought the owners some 12 million dollars in net profits, in a few years time.

The route to Silver City, via Caldwell and Homedale, passes through part of the Succor Creek region, an area noted for gem minerals. Collecting may be done here with profit. Silver City was at one time the county seat of Owyhee County, the old stone court house and jail may still be seen. Owyhee County is one of the most sparsely settled regions in the United States, the population of some 4,000 averaging about one person to the square mile, and 98% of the population is concentrated in the northern part of the county, in the rich irrigated farming district. The remainder of the county is practically deserted.

We were fortunate in having been able to spend four successive summer vacations at Silver City, some ten years ago. In all we spent about two months here, but saw only a very small part of the region. Few collectors have visited Silver City, one of the last frontiers for the collector.

Granite (granodiorite) rocks are dominant in the Silver City region, and these are thought to be a small peripheral outlayer of the great Idaho batholith which covers an area of more than 20,000 square miles in the central part of the state. Most of these intrusive rocks were exposed by erosion prior to the outpouring of the Tertiary lavas.

The geologic structure of the Silver City region involves a rather complex system of block faulting, and many of the very rich ore bodies were found situated in enriched fissure veins. As the mineralized veins weathered from above, secondary silver minerals were deposited in the fissures below. For this reason enormous wealth was taken practically from the surface, few of the shafts sunk were over a few hundred feet in depth. In most of the workings, when the leaner sulphide ores were encountered a few hundred feet below the surface, it was not found profitable to work them and the mine would be abandoned.

*History*—Placer gold was first discovered in this region in 1863, near the old settlement of Wagontown on Jordon Creek, which drains the Silver City region. It was some years later before the lode mines were opened. The Poorman mine on the north slope of War Eagle Mountain, was one of the first rich workings to be developed. The ownership of the property was in dispute, and the claimants, rather than go into court with litigation, engaged in open guerilla warfare. A large group of miners were entrenched in the property, and a settlement was not made until after the arrival of a company of Federal troops.

Those who visit Silver City today, may wonder why so large a mountain area is entirely devoid of large trees. In the early days of mining, wood was used as fuel to feed the steam boilers. After every tree over a very large area was cut down, the stumps were then dug out. Later Uncle Sam attempted to collect some $168,000.00 damages for the timber, but the stockholders had long since collected their fabulous boodle, and left for parts unknown. A number of the present day, prominent family fortunes were originally made from the Silver City mines.

Much of the ore taken from the Poorman brought over $4,000 to the ton, and was mainly silver chloride (cerargyrite) and ruby silver (pyrargyrite and proustite). Rich pockets were also encountered, shot full of thick veins of electrum, and ore of this type would frequently run into many thousands of dollars per ton. he high-graded specimen described above was an ore of this type; the specimen did not weigh over 10 pounds, figure out the ton value.

*The ore minerals* which the collector may expect to find on some of the old dumps included many fine silver minerals, a few of which are referred to here.

Argentite was very abundant in the mines of Florida Mountain and at De Lamar. Much of the rich ore mined in the early days was identified as argentite, but it appears likely that much of it was the comparatively rare naumannite, the physical properties of these two silver minerals are nearly identical. The naumannite carries selenium, which is not present in argentite. Azurite stains some of the silver ores in this region and this stain should not be mistaken for embolite. Clausthalite, a rare lead selenide, has been found in the ores of the Trade Dollar mine on Florida Mountain. Electrum occurred in many of the mines, and has been frequently found as "float" specimens at various spots on Florida Mountain and War Eagle.

Jamesonite was found in many of the workings, and is abundant in the ores of the old Flint district, some 5 miles south of Silver City. Marcasite is present in some of the fine gangue mineral specimens from Florida Mountain. On the snow white surface of the gangue minerals, the marcasite stands out in beautiful contrast. Miargyrite was found for the first time in the United States by Penfield, in specimens collected from the Henrietta mine at Silver City; it has since been found at few other localities in the United States.

Owyheeite is a new species, first found by E. V. Shannon, in 1920, in specimens from the Poorman mine. Prousite occurs in the Poorman ores, associated with pyrargyrite and polybasite. It is thought that much of the silver mined in the early days was in the form of polybasite. Pyrite crystals are present in many of the workings. Pyrostilpnite, another very rare silver sulphantimonite, was identified in the ores of the Henrietta mine. Stromeyerite and xanthoconite are two other rare silver minerals found in the Flint district.

*The gangue minerals,* from a spectacular standpoint, will prove the most interesting to the collectors, and fortunately these are abundant on most of the old dumps. While calcite is not abundant in any of the workings, probably the most spectacular gangue mineral to be found at Silver City, is the cellular or argentine type of calcite. Some of this calcite has been replaced by quartz.

The most spectacular specimen of cellular calcite, seen by the writer, was in the cabinet of a mine owner, and was taken from the Trade Dollar, Florida Mountain. This specimen measured about 10x12x4 inches, the calcite crystals were snow-white and topped the specimen; the base was massive quartz, feldspar, and calcite, shot full of various silver minerals. The calcite crystals were thickly peppered with minute and sparkling crystals of marcasite and various "ruby" silver minerals. The specimen was valued at $500.00 and was doubtless worth even more. A few of these fine specimens can be seen in the exhibit of the Idaho Bureau of Mines at Moscow. The writer has collected fine cellular calcite on the huge dumps at the Trade Dollar and at De Lamar, but of course, nothing like the sample described here.

Barite, chlorite, epidote, fluorite, graphite, leverrierite, muscovite, and siderite, are also found, but not in spectacular specimens, as a rule. Valencianite in fine snow-white crystals and masses occurs in abundance in many of the workings throughout the Silver City area. Some of the crystals are nearly colorless and transparent, up to an inch in diameter. Beautiful silver minerals are frequently associated with the valencianite.

The east slope of Florida Mountain, as seen from "Main" Street of Silver City. A portion of the elevated graveyard mentioned here, can be seen at the lower left. The white spots, high up, are old dumps. The white areas in lower foreground, are huge scars left by the Chinese placer miners. Millions of dollars in coarse gold and nuggets was taken from the placers, the gold did not travel far from its place of origin. Nearly 50 million dollars in silver was taken from the workings within this granite dome.

The valentianite (orthoclase, variety adularia) has been described by Shannon as "unusual", and he also calls attention to this material for specimen purposes. He also calls attention to the many fine specimens available on many of the old dumps. On the dumps, at the portal of a small tunnel, on the south side of the gulch leading up the south side of Florida Mountain, the writer collected a quantity of superb and large groups of valentianite crystals. There were hundreds of fine specimens on the dump, and still more in vugs on the tunnel walls and ceiling.

The summer months of July and August is the best time of the year to spend a pleasant and profitable vacation at Silver City. In the high elevation of from 6,000 to 7,000 feet, the bright sunshine days are not hot, and the cool nights bring sound sleep and pleasant dreams of tomorrow. The hotel generally operates on an uncertain basis, so you should be prepared to take care of your own needs. Shelter can readily be found in one of the many deserted houses or buildings.

### Homedale Area

A number of new localities have been recently discovered in the region of southwest Idaho and southwest of the town of Nampa. Locally these localities are usually referred to as Poison Creek, Graveyard Point, and Sucker Creek.

Homedale, Idaho (1), is a convenient point to reach the localities shown on the sketch map. Or they may be reached via Nampa. The Graveyard Point (2) locality has produced excellent quality "flower" or "plume" agate in a considerable quantity, in addition to other quartz family minerals.

The Poison Creek locality (3) is situated on the old Jordan Valley highway. The distance to the locality from the ranch building shown on sketch is about five miles. There is a summit on the old Jordan Valley highway about two and one-half miles south of the locality. This may serve in locating the exact place. Fine large "thunder eggs" are the main attraction at Poison Creek. The locality is about 300 feet from the highway and at an elevation of about 300 feet above the road, on the west side of highway. A number of caves will be seen in the hill which will act as a guide in searching for the diggings. Best specimens appear to be found in the lower levels from the caves.

A search should also be made in the gravels of Sucker Creek, west of Graveyard Point (2). For a long time collectors have obtained excellent material by searching along Sucker Creek over many miles.

### Sapphires in Idaho

The occurrence of gem sapphires in Idaho was first announced some thirty-five years ago, when gem stones were first found in the placers being operated near Meadows, on the high plateau divide between the Salmon and North Payette rivers. The country rock of this district is largely gneiss and the corundum crystals occur in wide quality were found with the sapphires in the placers.

Basaltic dikes, similar to the ones at Meadows, are common to the eruptive granites of central Idaho, hence sapphires of gem quality are found in the placers of this region. Frequently the gold placer miner is not familiar with sapphire in the rough and doubtless many fine stones have been cast aside from the sluice boxes, but a search for same should always be made in the placer concentrates.

### Weiser Region

There are a number of excellent localities around the town of Weiser, Idaho, which have yielded a rather large amount of material. These localities are well known to local collectors but have received no mention or only scant reference in the literature. The writer recently visited these localities and found a profusion of good material at most places.

The Manns Creek opalized forest is to the north of Weiser. Follow U. S. Highway 95 about 13 miles north of Weiser, turn west on dirt road marked "Manns Creek." Follow road up Manns Creek a distance of 8 miles. The best opalized logs appear to be found in Fourth of July Creek canyon on the south side of the road. This canyon is exactly one and four tenths miles above the prominent water hole on the road marked "Crystal Springs." Total distance from Weiser, about 21 miles.

The logs of opalized wood occur in one principal horizon, about 500 feet in elevation about the point where Fourth of July Creek enters Manns Creek. At this elevation there are prominent deposits of light colored sediments between the Miocene lavas. This horizon can be readily located in walking up the creek canyon, as the sediments are immediately above prominent outcroppings of Miocene shales, which are conspicuous throughout the area, and form dominating rimrocks in places. Rhyolite is the principal surrounding country rock, but basalts, conglomerates, and shales, all of Miocene age are also noted.

The opalized wood of Manns Creek is very similar to that of the Central Washington area, fully as colorful and well suited for specimens. The writer had no difficulty in obtaining a number of very large and excellent specimens of this colorful material. The only difficulty encountered was carrying the specimens over the rough terrain, for nearly a mile, down to the auto parking place.

So far as can be learned no real study has been made of the woods of the Manns Creek Petrified Forest. Field evidence would indicate that this forest can be correlated with that of Roosevelt, Washington. The age of both appears to be identical and the woods very similar. In both forests the writer has noted, hardwoods including oak, and conifers including pines and redwood, and swamp cypress. Like the Roosevelt, Washington Forest, the Manns Creek Forest is also of the "drift" type. The Manns Creek Forest has yielded a very large amount of material, but good logs of large size can still be found by making a search. This locality yields some exceptionally fine opalized oak, very similar in color to that found on Clover Creek, east of Bliss, Idaho, a better known locality.

Weiser Cove is near the town of Weiser on U. S. Highway 95. This locality yields a variety of material including fine opalized oak wood similar to that of Manns Creek and Clover Creek referred to above.

This locality is especially noted for the remarkably large and beautiful stalactites of chalcedony.

North of Weiser, on Highway 95 is the town of Mesa. Some high grade opalized wood and other minerals have been found in limited amounts at this locality.

### Hog Creek

The Hog Creek locality is about 10 miles from Weiser. Leave Weiser, cross Snake river bridge, and follow highway along Snake river. Local inquiry may be made for detailed directions. In many respects Hog creek locality resembles the better known locality of Antelope, Oregon. Similar gem minerals have been found at both localities. Like Antelope, the Hog Creek area has been a good producer of fine large quartz crystal geodes, and most excellent iris agate.

### Grouse Creek

To reach the locality, leave Weiser, Idaho, and follow the road along the river. Turn off main highway at the Eaton School (left turn). Go five miles to top of hill, which is also the end of the road. The agate is found over a considerable area.

This locality is especially productive of

The accompanying photo shows the entrance (looking South) to Fourth of July Canyon, from Manns Creek, North of Weiser, Idaho. Beautifully opalized trees are found in an upper horizon of sediments between flows of Miocene lavas. This locality has produced many tons of remarkably beautiful specimens.

Some of the best opalized logs have been found about one-half a mile South of Manns Creek, at an elevation of about 100 feet above Fourth of July Creek. The specimens have been exposed on the steep hillsides by erosion.

fine gem quality moss and banded agate of excellent color and well suited for cabochon cutting and for transparencies. Quartz crystal-lined geodes also occur, along with the large masses of gem agate.

### Opal in Idaho

Opal has been found at a number of localities in the state. The following occurrences are reported by Mrs. W. D. Lundstrum of Lewiston.

Somewhere around the years 1897 or 1898 a man named Requa discovered what he believed to be a deposit of commercial precious opal on the high hill opposite Lewiston, Idaho. He had no money with which to develop and explore the deposit, but the discoverer did have faith in the possibilities which finally brought him financial aid from the late George Lake, an early day jeweler of Lewiston.

The prospect was explored and some very fine opal was won. Due to the fact that at the time, some forty years ago, Lewiston was in a semi-isolated situation, and the opal mined appeared to have been offered only on the limited local market. As the owner of one fine cut stone said, "All the girls in Lewiston were wearing opal rings." So far as can be learned no effort was made to offer the opal to outside markets, despite the fact that good opal was found.

The gem opal had a deep "fire" of red, blue and green colors. Dr. S. C. Salesberg, of Lewiston, who was interested in the early day mining of the opal, states that while several hundred dollars' worth of gem opal were sold locally, the venture did not prove profitable at the time and was abandoned.

For several years my husband and I have searched the hills opposite Lewiston in the hope of finding some trace of the old opal diggings. Early residents of Lewiston have been questioned in the hope of gaining some clue as to the locations, but so far this has not led to the rediscovery of the old properties. The hills opposite Lewiston are extensive and high and cut by numerous canyons and there are no special outstanding landmarks, as the area is free of timber growth.

After forty years the effects of erosion, slides of rock and dirt could easily have obliterated the old shallow workings. Recently my husband questioned a miner who had worked in the old property and he states that the old workings were partly filled in to prevent cattle and sheep from falling into the excavations. Hence the location of the old mine still remains a mystery, but the possibilities of rediscovery are not at all remote.

Some fine opals from the original workings are still held by Lewiston residents.

Small amounts of precious opal are found from time to time in the lava rocks in the vicinity of Lewiston. Across the Snake River from Silcott, Washington (near Lewiston), about 900 feet up the side of the hill, is a prospect hole where good fragments of fire opal have been found recently by local mineral collectors. Four excellent fragments, large enough to cut small cabochons, were found on the old dumps at this locality. It is possible that more work on the prospect may yield additional opal. The rock carrying the opal is a highly vesicular basalt.

Further down the river, near Moses, Washington, is a much larger prospect hole, situated high up on the hillside. It is said that excellent precious opal was found here, but a visit to the locality failed to verify this, although no work was done. Common white opal was found in scattered specimens. The wife of one of the railroad employees told me that along the railroad right of way, just below the prospect, some fragments of fire opal had been found. Possibly this is "float" opal from a source on the hills above.

If the presence of fragments of "float" fire opal found at various localities can be taken as a criterion, it would appear that precious opal must exist in at least small deposits at a number of localities in the vicinity of Lewiston. Extended exploration work would perhaps bring some commercial producing localities to light.

At Moscow, Idaho, some forty miles to the north, several thousand dollars' worth of precious opal was mined some years ago. This opal, like that of the Lewiston area, was found in cavities in basalt. The Moscow find of opal was made in an accidental manner while sinking a well in the basalt rock, the opal being encountered quite near the surface. Other similar, but less valuable, finds have been made in this region during the past fifty years, but few of these were recorded in the mineralogical literature. In many cases the opal was not recognized as having any commercial value and usually no effort was made to develop the locality.

Throughout the Lewiston Valley common opal is found in quantity at numerous localities. A beautiful creamy common opal has been found near the road leading down into Lewiston from the north.

In a canyon several miles east of Lewiston occurs a thick ledge of common opal of great beauty and in a riot of colors. Unfortunately this material is quite brittle and appears to chip and crack when exposed to the elements. The surface material does not seem suitable for gem cutting owing to the tendency to fracture.

On Craig Mountain, twenty miles south of Lewiston, occasional deposits of hyalite opal are found. Most of this is clear and colorless like glass, but some is found with delicate tints of pink, red, yellow, and black. The color, however, is due to the reflection of color from the rock, the coatings of opal do not appear to carry the color.

At Orofino, forty miles east of Lewiston, hyalite is found in combination with natrolite. This locality was first found by Mr. Byers Sayles, Orofino collector.

D. B. Miller, member of the Idaho Gem Club of Boise, has presented some additional data on the opal found and reported in Idaho.

In the southwestern part of Idaho both common and fire opal have been found. E. V. Shannon in "Minerals of Idaho" reports two localities in Owyhee County, but the directions are confusing and hard to find.

The old Opaline Mine referred to by Shannon appears to be worked out so far as surface deposits are concerned. The opal occurs in a fold in rhyolite and there are several of these formations further up Squaw Creek. Very little opal of cutting quality has been found in recent years at the Opaline Mine.

The writer recently found some small but good quality fragments of fire opal about 10 miles from Opaline near the summit of the ION highway on Squaw Creek. Some claims have been filed in this region, but so far no commercial opal has been won. The opal appears to occur mainly in small vesicular pockets in the igneous rocks. About 15 miles west of the above locality is another opal locality on Poison Creek. The opal at the Poison Creek locality is also found in rhyolites and associated with nodular masses of "thunder eggs."

The old "cherry" opal digging just above Black Canyon Dam near Emmett, Idaho, has also produced some good specimens of fire opal, found again in a decomposed rhyolite rock.

The Brace Ranch near Cliffs in Owyhee County was visited recently by the writer to search for fire opal. Seams and cavities in the rock are often filled with splendid fire opal, but it is next to impossible to obtain material suitable for gem cutting. By careful work good specimens can sometimes be obtained. Brace Ranch is about 40 miles from Boise.

Old mining records show that opal claims have been filed years ago on Castle Creek in Owyhee County, but the "old timers" in the region state that little opal of commercial value was produced. These old diggings might be worthy of further exploration.

The famous old Clover Creek locality that has produced some remarkable examples of opalized wood (common opal) is also said to have yielded specimens of "float" or fire opal. So far as can be learned the fire opal of this locality has not been found in position.

### Idaho Star Garnet

Probably the finest asterated garnets found in America or elsewhere are the specimens from Idaho. The deposits of star garnet in Idaho appear to be scattered over a wide area, but the best localities seem to be in the area between Meadows and Orofino, in western Idaho.

The star garnets of Idaho are found mainly as water worn crystals or pebbles, eroded from the granites and schists which cover much of western Idaho. Asterated gem garnets may be found in any of the gravels of streams draining regions of pegmatites, granites or schist, but the various forks of the Clearwater and Salmon rivers appear to carry the gem in greater abundance. Collectors passing through this region of Idaho may do well to search the stream gravels as outlined above.

Good asterated garnets are also reported in the stream gravels of parts of northeastern Oregon, where similar igneous rock formations occur. However, the quantity and quality of the gem from known Oregon localities does not equal those of Idaho.

The steep cabochon shows the star to best advantage. Even specimens so opaque as to be otherwise worthless as a gem, can be utilized provided a star is present. Not all garnets of Idaho or Oregon show asterism, a few stones will be found of very fine quality, and still fewer will be found to show the six-rayed star in place of the customary four rays. Since garnet is isometrical in crystallization little attention need be given to the orientation of the crystal, for most specimens show several or more individual stars when cut into a spherical form. The stars definitely follow the planes of symmetry and the crystal axis.

Asteriated or star garnet occurs at a number of localities in Idaho, but the best gems are found along Emerald Creek (also Ruby Creek) in Latah County, in the northern part of the state. This locality yields exceptionally well developed crystals, and some show an excellent star and are of gem quality. They range in size up to two inches or more in diameter. Dodecahedrons seem to predominate.

The garnet crystals are found in the creek debris, and at points along the creek where they have weathered out of the schist rocks, they have been collected in quantity for a number of years. Garnet crystals have a specific gravity nearly twice that of common rock, hence they tend to gather in pockets in and along the creek bed. When a good pocket is encountered, it may yield a quantity of excellent garnet, some water worn, and some showing finely developed crystal faces.

### Gems of Idaho

Charles O. Fernquist of Spokane, Washington, presents here a comprehensive description of the gems found in Idaho. This list includes all the gem occurrences that have been reported, and include some described for the first time by the writer.

A few diamonds were found in the gold placers, at the head of Little Goose Creek Canyon, Adams County. From a test operation on several cubic yards of gravel three small diamonds were procured, the largest weighing a third of a carat and a nearly perfect octahedron. Diamond has been reported in several other placer mining districts within the state.

*Custer County.* Clear transparent quartz crystals, lining chalcedony geodes, that have weathered out of the basalt, are found in the Upper Valley of Lost River. Some of these geodes are two feet or more in diameter.

*Benewah County.* Very large fine quartz crystals are found from time to time in this county. In the Spokane, Washington, Museum is a clear quartz crystal, sixteen inches long and twelve inches in diameter, found near St. Maries.

*Idaho County.* Quartz crystals are found at numerous localities in this county. In the gold placers near Warren, water worn pebbles and small boulders of optical quality quartz are common.

*Shoshone County.* Large groups of fine clear quartz crystals are common to many of the mines of this region.

*Owyhee County.* The mines of Silver City are noted for the many fine large slabs of quartz crystals, the crystals while generally not over one inch in length are often of excellent clearness and brilliance. The mines of Florida mountain have yielded masses of orthoclase, coated with perfect crystals of quartz, with small masses of rare silver sulpho salts growing upon the quartz. The enormous and numerous dumps of the Silver City mining district comprise a Mecca for the collector, not only for quartz but numerous other minerals as well.

Amethyst is not a common mineral of Idaho, but is found at a few localities.

*Blaine County.* On Pole Creek, near Hailey, amethyst crystals are found lining geodes of massive chalcedony.

*Custer County.* In the Low Hills, near Lost River, amethyst is found lining geodes. At this same locality some fine phantom quartz crystals have been found, some showing a faint interior outline of amethyst. Little or no collecting has been done at this locality.

*Owyhee County.* Very pale amethyst is found in the mines of Silver City.

*Blaine County.* Translucent white and bluish chalcedony occurs over a rather wide area in the Tertiary basalts of the Hailey district. Many of these laval hills are strewn with nodules, geodes and fragments of chalcedony, agate and jasper, some of which has good color and is suitable for cutting.

*Custer County.* Near the north fork of Lost River, chalcedony occurs in a similar manner to that of Blaine county, but possibly in lesser amounts.

*Idaho County.* Chalcedony, agate, jasper and silicified wood are found at a number of localities in this county, principally along the streams, this being true of many other counties of central Idaho. Much of the region of central Idaho is isolated and not supplied with good roads, hence the area has received little or no attention from collectors, yet numerous fine minerals other than the quartz minerals are also available here.

*Owyhee County.* Chalcedony is common to the basalts of this region, but much of it seen as a gangue in the mines is of a flinty nature. A fine specimen of translucent pink chalcedony coming from the De Lamar district is in the collection of the writer.

*Lemhi County.* Chalcedony is the principal gangue mineral in the veins of the Parker mountain district.

*Valley County.* The cinnabar deposits of the Yellow Pine district carry chalcedony, some of which is stained a fine red by the cinnabar, making splendid specimen and cutting material.

*Custer County.* Much of the ore mined in the Alder Creek (Mackay) district carries red and yellow jasper associated with chrysocolla and opal. Some of this material has excellent possibilities for use as a gem stone in addition to its specimen value.

*Bear Lake County.* At the Humming Bird mine, in Paris Canyon, near Montpelier, the copper ore occurs with jasper of good color. The bright red jasper-quartz carries a disseminated red iron oxide and green-malachite, the red and green making a pleasing contrast, rendering the material suitable for specimen and ornamental purposes.

*Blaine County.* Red and brown jasper are common in the Tertiary lavas, east of Wood River, near Hailey.

*Fremont County.* Jasper is the principal gangue mineral, at the Scott Mine in the Skull Canyon district. Galena crystals are imbedded in the yellow, brown and red jasper, adding to the attractiveness of the material.

*Washington County.* Jasper constitutes the chief gangue mineral of the manganese ores, on the Snake River twenty miles below Huntington, Oregon.

Opal in a diversity of varieties is found in many parts of Idaho, where it generally occurs in the Tertiary lavas. Common opal and opalized wood in a wide range of colors from white to nearly black, from transparent to opaque, is common. Precious and semi-precious opal is also found at a number of localities. The list of occurrences given here for opal is by no means complete, but it comprises all the localities of which the writer has data, the same being true of the other gem minerals of Idaho. If more collecting and prospecting is done in this state in the future many more localities and "finds" will doubtless be noted.

*Boise County.* Along Moore Creek at Idaho City, fire opal occurs as a cementing material in Tertiary lake bed sandstone.

*Kootenai County.* About six miles east of Rockford, Washington, at Setters, Idaho, is a gray altered basalt in which occurs common opal. Some of this opal can be had in large masses and in a wide range of colors, yellow, red, brown, green and white, from transparent to opaque, making good specimen material.

*Latah County.* Choice precious opal was found while digging a well in the basalt, at Whelan in 1890. Some mining was done here at the time and this district has produced some of the finest precious opal ever found in North America. In this same county, near the Salmon River, it is reported that very fine opal occurs as nodules in a hard trachytic rock, one of these stones is said to have sold for a thousand dollars. The writer has been unable so far to get detailed data on this locality. Near Kendrick there is some good dark gray opalized wood.

*Lemhi County.* Masses of flinty common opal, ranging in color from yellow and pink to black, occurs near May. In 1902 opals were discovered on Panther Creek, six miles from its source, at an elevation of 7000 feet, the opal occurring in a large porphyry dike and in assorted colors. Some good transparent opal showing broad patches of "fire" can be had here. This opal being brittle and occurring in hard rock it is difficult to remove pieces suitable for cutting, but left in the matrix as found it is well suited for cabinet material.

*Lincoln County.* Very well preserved opalized wood occurs at Clover Creek. The color ranges from yellow and brown to nearly black, with the grain of the wood showing in fine detail.

*Nez Perce County.* Near Lewiston, some local collectors have obtained some red transparent opal, similar to the Mexican variety, which can be cut freely into cabochons.

*Owyhee County.* In 1893 opal was discovered, about three miles from the Snake River, to the south of Homedale. This opal occurred in association with a vein of hard jasper from four to five feet in width, the best opal occurring along the contact walls.

Precious opal has been found and is known to occur at numerous localities in the northern part of Owyhee County, between the Snake River and the Oregon boundary. Commercial mining has been done near old Sommer Camp, Enterprise, Wilson, and Chimney Butte, many of the pits dug some years past can still be seen. The opal of this region occurs in a highly vesicular basalt, the opal filling the vesicules as amygdaloids and are mainly of small sizes. Much of it is milky white and colorless and without fire. What precious opal was found was of very high quality and suitable for gem cutting. About three miles west of Enterprise a number of old workings can be seen, here the opal occurs as veins and seams filling joints and cracks; in a chalk-like decomposed rhyolite. White and milky white opal is plentiful here, but very little good precious opal can be found. Some nodules containing opal are also available. Near Opaline, fossil bones of an early horse, Protohippus of Pliocene age, have been found encrusted with fire opal. This entire region of northern Owyhee county, is an excellent field for the collector in search of specimen material, the old dumps will yield much common opal and chalcedony and other quartz minerals. The region is very sparsely populated, the roads are few, commercial accommodations lacking, so the collector should carry camping equipment upon entering this territory. Very few collectors have ever visited this region.

*Clearwater County.* In the gold placers along Rhodes and Orofino Creeks, near Pierce City, sapphires have been found as water worn pebbles and crystals. The colors vary but are mainly blue, little of it is suited for gem cutting.

*Adams and Washington Counties.* Sapphire is found in the placers at a number of localities in these counties, some of it being commercial quality. Stones of amethyst, pink, and blue color have been found in the placers near Meadows. Some stones were sold years past but apparently no commercial deposits of sapphire exists, neither has the gem been found in its original matrix, according to records available, Several other localities in Idaho where placering is being done, yield sapphire from time to time, but not in quantity. Practically all stones found are encountered in an accidental manner in connection with the gold placer operations and it is quite likely that many more good gem stones would be found were a search made for them.

The green copper carbonite, malachite, is common in the zone of oxidation in many of the copper mines of Idaho but little of it is suited for other than specimen purposes.

*Bear Lake County.* At the Humming Bird mine malachite occurs which has been described under the heading of jasper.

*Owyhee County.* That variety of orthoclase called valencianite and found in abundance in superb crystallizations in some of the mines of the Silver City district, can be seen in fine specimens in the Spokane museum. Good specimens of this material can be collected from the old mine dumps on the south side of Florida mountain. The crystals in the groups varying from quite small up to about one inch, the larger crystals being a pale yellow while the smaller ones are snow white and translucent. It is suitable mainly for specimen purposes.

*Latah County.* At the mica mines near Avon there is considerable beryl of a yellowish green color. Small fragments, which are transparent and of a pale color suitable for gem cutting, are available here.

*Nez Perce County.* Good blue beryl crystals, variety aquamarine, have been reported from this locality.

Zircon is found rather widely, as a fine sand in many of the placers throughout the state, little of it being of sufficient size to permit its utilization as a gem.

*Idaho County.* The writer, while conducting placers on the American River, collected a number of small transparent, orange colored, zircon crystals of hyacinth variety and of gem quality. It is very likely that gem zircon exists in placers in other parts of the state but probably not in large size stones.

Topaz is frequently reported as being found in quite large size crystals but upon examination most of these prove to be quartz. Topaz, in minute grains, has been noted in the placer concentrates in different parts of the state.

*Idaho County.* In the Warren district, a fine blue colored topaz of large size, was found in the placers. In recent years colorless crystals of smaller size have been reported from this region.

*Shoshone County.* Cyanite occurs in the metamorphic rocks south of Avery in fine color suitable for cabinet material. The writer has in his collection a number of fine deep blue, translucent crystals, of gem cutting quality from this locality.

Zoisite is found at a number of localities in Idaho, but the best comes from the mines of the Seven Devils district in Adams County, where it occurs as a contact mineral in abundance. While much of it is not suited for gem cutting a great deal is well suited for cutting and polishing into cabinet material, the delicate pink color making it attractive.

The most notable locality for this mineral is in the Seven Devils mining district in Adams and Washington counties, where the epidote occurs as a contact mineral in the copper deposits of this region. Associated with the epidote are a number of other gem minerals, mainly quartz, garnet, malachite, azurite, hematite and chrysoola. At many localities in this area are found epidote crystals of superb color, excellent terminations and spectacular sizes. The region is quite isolated, mountainous and in the past only a few rough roads served the district, hence very few collectors have visited this region. Those engaged in mining are as a rule not interested in the gangue minerals and many fine specimens were cast out on the dumps. With better roads giving access to this district it is predicted that this region will receive greater attention from collectors and that many fine specimens will be forthcoming.

*Shoshone County.* To the south of Avery, staurolite is a very common metamorphic mineral. Both single and twinned crystals have been found in large sizes in addition to the fine cruciform types. Good specimens can be picked up on the surface, which show only slight weathering, but far better material can be had by getting below the surface. Crystals up to five inches in size are available. This locality should receive more attention from the collector.

While ilvaite is not usually looked upon as a gem mineral, yet some very good specimens which can be readily polished are available at the South mountain mining district in Owyhee county. The ilvaite occurs here as large crystalline masses in white quartz and calcite, the black ilvaite making a pleasing contrast. This locality produces by far the best ilvaite found in America. Large masses of this material can be seen in many of the larger museum collections.

*Adams and Washington Counties.* Chrysocolla is abundant in the copper deposits of the Seven Devils mining district. Large masses occur with good color and an opaline texture.

*Custer County.* The copper silicate ores of the Alder Creek district carry jasper colored by the oxidized copper minerals, making a material suitable for gem purposes;

### Rabbit Springs

This is one of the newer localities in Idaho, known to few gem hunters. It is described here for the first time, by Charles C. Merrill of Buhl, Idaho.

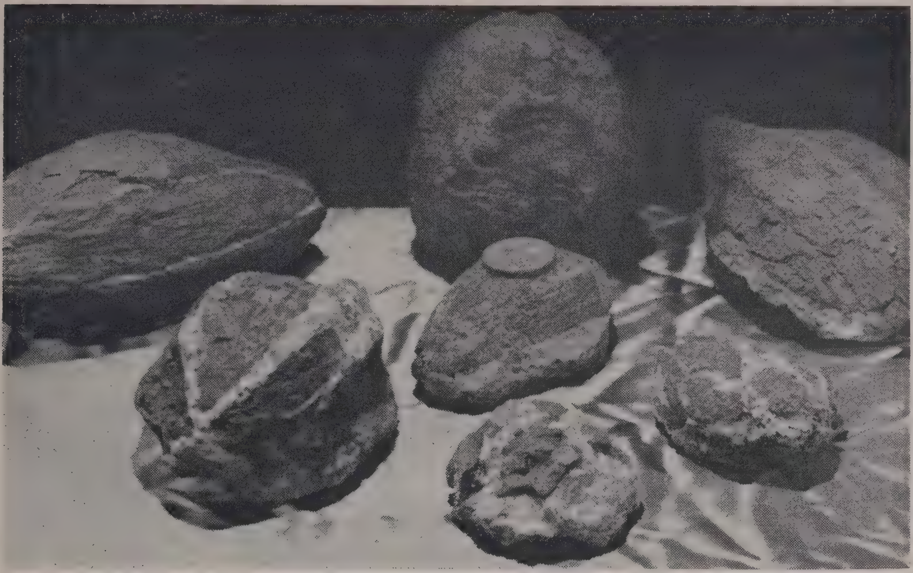
Discovery of fresh location notices meticulously posted on eight Radio-Active mineral claims in compact formation near Rabbit Springs south of Twin Falls close to the Nevada line set us to investigating.

When the placing of corner stakes representing quite an outlay of time and labor continued our newshound nose began to quiver. These names unknown to us were the monikers of nearby Rogerson folks. Furthermore, the locating of the claims had all been witnessed by the same party, one Jack Rawlins.

We think we brought this all about (we and Uncle Sam and his current drive for uranium and that drags Joe Stalin in, too, doesn't it?) when we stacked up various hunks of vein chalcedony for a lady friend of ours who wanted some unusual stuff for a contemplated rock garden.

The specimens were too heavy to haul in our car so we came after them in a sturdy pickup. The rocks had been piled conspicuously in the heavy sagebrush so that they could be readily found. They had been found all right and had completely disappeared. In their stead, stood these posts with their twin tobacco cans, each with a location notice in it.

Telltale truck tracks meandered through the sage. I had picked up geodes here for years and thought I knew all about the area. This was the place I called Hiawatha's Battleground and had so much fun writing about.



New and intriguing geodes and nodules found by Charles Merrill, near Rabbit Springs, Idaho, close to Nevada line. These specimens range in size up to about 12 inches in diameter, some show good fluorescence. The silver dollar in photo indicates size of specimens in this group.

But here was a type of geode strange to me with its cantaloupe or squash shape, its dense red shell with uraniferous chalcedony ribs. Many of them of huge size and unexploded. The new area was so vast and so thickly strewn with geodes which fluoresce a vivid green, some of them showing a bright pink along with the green, a very pretty combination.

Being only 16 miles from Contact, a copper mining town we went exploring mine dumps. In the test house of Pilot Mine No. 1 we were entertained by a very accommodating gentleman. He introduced himself as Jack Rawlins.

Yes, he was the one who had helped the boys out by witnessing their claims. Yes, he knew the area excited a Geiger counter as well as the guy operating it. Yes, government men had confirmed a count of 46 to the minute, indicative of ten per cent uranium.

"But, you came a day too soon," he said, "tomorrow there are going to be men here from all over the United States, some big shots among them."

Of course we went back the next day. Sure we staked us some claims. In fact, we got so interested in choosing the very best spots—the ones where these new geodes lay the thickest—for our claims, that we didn't get over to Contact to mingle with the big crowd and exercise our newshound proclivities.

Nothing has appeared in the local papers. Neither did we succeed in finding the test hole which had supposedly been sunk during the last week. The prospector named as the one who had operated the Geiger counter and his cousin who reportedly had shot out the hole are very close mouthed indeed.

This grieves me sorely for I knew those lads when they wore diapers and have polished agates for them free of charge.

# Special Northwest Tour

Frank J. Campbell
*Waterford, Michigan*

*Note*—During the summer of 1949, Frank J. Campbell made an extended tour of the Northwestern and Western states, covering some 11,000 miles. ForD and Campbell visited hundreds of gem hunters, and many localities. For the benefit of others who may wish to make similar tours in this region, his descriptive paper is presented here.

Most of the rock fanciers encountered on our jaunts are at or well beyond middle age. They have usually lived active lives. The task of earning bread and molasses is not as serious as it was once. Some are retired. More have been through long periods of sickness and distress during which they have had time to think things out. Most have emerged with new values. Many former yard-sticks of life spaced with $ $ $ $ $ signs have been discarded by them.

Just how far the Great Craftsman succeeded for upwards of half their lives in hiding the beauty of rocks from their eyes is a mystery to them now. Some think that it was a sort of Santa Claus ruse . . . holding the best gift until the last.

There are others who hold that the old Prophet Ezekiel had the right dope when he wrote way back there twenty-five hundred years ago: "Son of man, thou dwellest in the midst of a rebellious house, which have eyes to see, and see not . . ."

ForD — our constant companion on all rock-hunting trips — pondered these facts. She was ready for a trip to the Sacramento convention and to the great northwest. Sacramento was celebrating the "49'er" centennial of the gold rush. ForD is a "49'er" in her own right. To be in keeping with the spirit of our surroundings we grew a bunch of "49'er" whiskers.

This is intended to be a story about the fine people met on this particular rockhunt; where they live, what they do, and the lovely rocks they hunt and find in their respective communities. Now and then ForD may pause to marvel at some of earth's wonders along the way. If, sometime, you travel that way you will pause also — and perhaps then understand.

Winnemucca, Nevada, is up in sparsely settled Humboldt County. C. A. HOLIDAY and his good WIFE, P. O. Box 656, were busy in overalls putting the finishing touches on a fine gems and minerals shop nine miles east of town on U. S. 40. Charlie has some beautiful Nevada Wonderstone gathered not far afield. From one spot he has collected sulphur crystals that vie in beauty with those from Sicily.

Virginia City, Nevada, should be a "ghost town" but it is still far from that. SAMUEL L. CLEMENS, a young reporter on the *Enterprise,* and a lot of others with huge thirsts during those rip-roarin' days, spent their money so freely while the silver and gold was coming up and the whiskey was going down that a score or more of the lavishly equipped old saloons still operate "as usual", almost. Tourists purchase sample drinks served in the old glasses (just to test the effect) while rock collectors search the old mine dumps.

Travelling westward we had gained an hour each day. ForD hit a steady, easy pace. Third night at the Utah line — 1705 miles — all in daylight. Fifth night in Reno, including a day in and around the beautiful communities of Ogden and Salt Lake City. All having gone so well we had extra days to spare before the convention. So we dropped down to again visit Yosemite National Park; entering from the east over the rugged Tiogo Pass.

The Sierra Nevada is a vast batholithic intrusion of granite nearly 400 miles long and 80 miles wide, of late Jurassic time — say 150,000,000 years B. C. Yosemite National Park—a section of those mountains—is a region of sublime laccoliths. Glacial action smoothed the faces of those laccoliths surrounding the valley; erosion levelled the valley floor. With a vision of old El Capitan or old Half Dome, in mind while down in his basement grinding and polishing pretty pebbles, a lapidist most humbly meditates his insignificance.

HARRY E. FOULKS, 4115 Wilmarth Ave., Stockton, Cal., is a rock digger who doesn't have anything to sell any more. For years Harry owned the famous Rainbow Ridge opal mine in Virgin Valley, Nevada, but sold everything including the solid stone cabin and three rusting milk cans in which he had hauled drinking water. Harry mined many magnificent specimens of fire opal limb casts and is satisfied.

DR. H. C. DAKE, Portland, Oregon, gave an excellent running account of the Sacramento convention and who was there in the September 1949 issue of *The Mineralogist.* ForD was there, too; out in the parking lot.

And ForD did something else. She went over to Coloma, California, to the spot where Marshall discovered the gold in the race below Sutter's Mill that 24th day of January, 1848, and thus touched off the grand scramble known as the "49'er" gold rush. Standing alone among those water-worn rocks today, a strange feeling is apt to fill the soul of a rockhound. It creeps in uninvited. It chokes a little. It is akin to the one experienced while standing beside old Plymouth Rock where the Pilgrims had landed in 1620 and breathed their prayer of thanks.

A trip down to the coast and over the Bay and Golden Gate bridges is a "must". Up the redwoods highway is another "must". They call those trees "old" but they would be quite young on any geological chart.

GEORGE A. GRIEVE, 1121 Broadway, Eureka, California, literally does business in a "House of Agates." it is the most beautiful structure of the sort we have seen. With a lavish disregard of their worth, he has veneered the building with choice specimens. Windows and doors are cased with polished half-sections of agate nodules. Exquisite—is the word to describe it. George humbly and honestly confesses that he collected a lot of them just over the state line in Oregon.

A gas man recommended driving an extra 250 miles up into Oregon and then back down in order to get into northeastern California. Roads, like everything else, are comparative. He didn't know where rockhounds go. ForD was provoked and slightly offended at the insinuation. She headed east across the Coast Range mountains. Of course gears were used in places but that is what they are for. The reward was a fine view of Mount Shasta and the old gold placer workings to the south.

Mt. Lassen, that recently active volcano, had to be scaled. Thirty-two years back when we were last in the vicinity it was smoking and smudging until the air was so filled that little could be seen within a hundred miles. Now all is peaceful and a good road leads one up to the snow line. A trail leads to the top.

On to the northeast at McArthur, California, resides B. CLYDE JOHNSON. His job is selling groceries and pumping gas. When a rockhound comes along and makes himself known, the "job" for Clyde, his wife, and the daughter immediately changes to talking "fire opals". That boy has 'em! Dug them himself. He has a claim over in the Virgin Valley. Spends all of his spare time camping and digging; and some time that he shouldn't spare, according to the wife.

Cedarville, California, is a good jumping off place for the Virgin Valley. An old-timer in Cedarville switched his cud and said: "See that wooden grocery store on the corner! That used to be the bank. For two months in that window lay the big, black ROEBLING OPAL. Worth a million dollars! Feller sold it for a quarter that, I heard. Looked like a hunk of coal. But fire! Purtiest fire you ever seed. If hell's fire is anything like that wuz, damned if I don't want to go there and live as long as they'll let me."

The distance from Cedarville to the Virgin Valley is 85 miles across open country. A full tank and extra gas is needed. The route is not a highway but it is a good ranch road with plenty of dust. (Probably grease slippery when wet.) Two different black obsidian areas are crossed. The road graders have broken specimens until they glisten like glass in the sunshine for a mile at a stretch.

MARK FOSTER, mail Virgin Valley via Denio, Nevada, has lived in a tin-and-rock shack in the valley so long that he is considered almost a part of the valley. In W. P. A. days a camp was built, an artesian well was drilled and the boys built a dam to hold the water making a wild-life preserve. Near this well all visitors camp. The water flows warm but palatable. Mark's council about the "diggin's" is sought by all commers. Mark looks after the Bonanza Claims.

KEITH HODSON, his splendid WIFE, the two children and the family dog are apt to be found anywhere where the going is tough but the minerals precious. (Keith controls the Nevada Turquoise Mines, Inc., at Mina, Nevada.) In Mina is where we last met the group. The children and even the dog remembered us in spite of the whiskers when we arrived at the famous Rainbow Ridge opal mine. The Hodsons had recently purchased it. With the temperature 100 outside it was cool within the thick stone-walled house. The three milk cans have been increased to six for Keith has to jeep-haul all water for the family from the well twelve miles distant.

The temperature in the mine is around 60. It is seemingly cold there. The old tunnel went through the ridge from east to west. Opened to the atmosphere the old supporting arches and walls at the east end have crumbled until it would be exceedingly dangerous to venture in. In that area is where the Roebling Opal was found. The west end entrance has been cleared and timbered—a rare material for the area. Off this tunnel Keith operates in a new drift which is being worked for the beautiful firey opal.

Rockhounds are advised not to go to Virgin Valley with any idea of stubbing their toe on any nice big opal. Yards of hard volcanic ash has to be picked from some ledge, shoveled and broken. After that, by careful hand searching, a few small specimens may be found — if lucky.

BEEBE RANCH is up a jeep-trail at the head of Virgin Valley. Mail comes in via Denio, Oregon. The Beebe boys have a spot that can be seen a mile or two away on the side of a hill across a deep gully. There they dig a milky green, vitreous appearing hyalite opal and pack-saddle it to the ranch house. This material fluoresces a beautiful greenish-yellow. They also find, in a calk-like vein near by, a funny little formation about the size, thickness and shape of a cookie that fluoresces unlike anything usually seen.

It is about 40 miles up to Denio, Nevada-Oregon. (The half dozen buildings straddle the state line.) But we had to drive there for gas and for food and lodging. We had no extra supply and were not equipped to camp. Nice country if you like the remote and weird. We do. And during the evening a MR. SMITH brought in samples of a rusty old quartz rock for identification. It was quite similar to specimens collected near Prescott, Arizona, that were rich with gold. Our pocket glass soon proved that. Did the old boy's eyes sparkle? They did! He knew where there was a lot of it.

ForD backtracked to California and then on up into Oregon. MRS. McLEOD, Klamath Falls, Oregon, was on our list for a call. She is well known among rockhounds. Her name and address were not listed in the telephone directory. The post office gave us no help. Several random inquiries were without success. We had to drive on disappointed.

CRATER LAKE is not something to be picked up, put in the car and carried home to the specimen cabinet. But awsome memories are brought away. Close the eyes and dream . . . and wish that you had had a bleacher seat at that spectacle in process of formation. (A bleacher seat would have been plenty close enough.) The theory now favored and expounded by the Park Authorities is that — "the way down under magma was blown through numerous smaller volcanic vents for miles around until the 'celler' was completely honeycombed." Then it happened! Former Mount Mazama with its 12,000 feet of loftiness fell plumb down through into hell and never came back up. It must have melted again into magma. The hole that was left is 6 miles across and from the highest, jagged remaining stumps to the deepest parts of the water filled lake is 4,000 feet.

(How can anyone who likes the outdoors and the wonders of this old Earth keep from digressing away from "people", our subject, amid such surroundings?)

Bend — in Central Oregon! Blessed be those rocklovers who live thereabouts! Paradise? No—not quite—but it is on the edge. And the Chamber of Commerce shouts about the few slippery little fish that soon get smelly after being caught and says not a word about where to find the beautiful, everlasting agates painted in exquisite design and tints by the gods of the ages!

P. L. FORBES and his devout WIFE built for themselves a "Museum of Wonders" beside the highway. Then, in one corner of the surrounding yard, they produced in miniature a whole county of scenery, with marked trails up and down which you are welcome to tramp. Obsidian in rare colors and design is but one of the Forbes specialties.

CHET and MARGE SPRINGER, 862 Roosevelt Avenue, (near the south end of town) have a plume agate that is hard to equal; to say nothing of beating. It is truly magnificent. Chet is a lucky chap. He gets paid for hunting. Being a geologist he is sent out by the State Highway department to locate new beds of gravel. Can he help it if he stumbles onto a vein of solid plume agate? And if some of that same agate loosens while he is there and rolls down the mountain right into his car — then what?

GREEN'S AGATE SHOP is a dandy. "Pop" Green goes in for (or out for) "thunder eggs." ForD took a look and guessed that he hatches them. Why? Because the back yard of his home is fenced with chicken wire. Inside the wire are arranged row after row of nest-like cubicles all neatly painted and filled with specimens. Sorry—the gate was padlocked and a note stated, "Pop's out hunting."

In Bend we had again failed in obtaining the local street addresses of rock people. But our luck turned. MRS. LEE PHELPS, 1104 Portland Avenue, seeing our whiskers in the hotel coffee shop inquired, "Rockhound?" You can bet we were glad to meet that lady. She and her husband are enthusiastic hunters also. She knew 'em all and helped us to make out the list of addresses.

PETERSON'S ROCK GARDENS, nine

Gem hunters pause to talk shop in the rolling sage covered hills of southwestern Idaho. From left, Julian Field of Payette; Frank Campbell of Waterford, Michigan, and Earl Van Deventer of Caldwell, Idaho. Millions of acres of the far western states are similar country. The gem materials are generally found weathered out on the surface, and when outcroppings are located, digging is frequently productive. Photo by Herbert Enochs of Caldwell, Idaho.

miles north of Bend a little off the highway, is the one sublime example of the adage, "Build a better mousetrap in the woods and the world will beat a path to your door." Peterson is a farmer who loves and collects beautiful rocks and boulders. Artistic blood is in his veins. And he is handy with a trowel and a bucket of cement. To gratify a rare craving for "art for it's own sake," he began building small structures here and there about the lawn. Today a full acre is dotted with his works and beautifully landscaped. There must be a million rock specimens included. License tags on the 2-or-3 hundred cars that stop daily are from every state in the Union.

OBSIDIAN BUTTE is just off highway U.S. 20 some seventy-five miles east of Bend on the route to Burns. A highway sign points to the Butte. Between mile-posts 79 and 80 there is good collecting on either side of the road. In addition to black and banded ForD brought in red landscapes and clouds on black; silver clouds on black; and a good piece of gold in black. Part of it is semitranslucent when slabbed and is very pretty indeed. It is all quite free from gas bubble.

DALE HAMMERSLY, his WIFE and RUTH, 1040 East 3rd Street, Prineville, Oregon, constitute one diligent, happy rock-family. Dale is putting Prineville on the map in a new way. He alone brought a display of choice material to the Sacramento convention. He has recently built a new lapidary shop, equipped it with the latest machinery, and is displaying some handsome material. Dale goes in especially for that choice agate from the Eagle Rock and the Bear Creek localities. His "angle wings" are a sight for the soul but they are mighty scarce and require a lot of hunting at high altitudes after long hikes.

What a country that is! And what a group of friendly rockhounds are found there! HERBERT W. LAWSON, Terrabonne, Oregon, is just up the line. Herb is off the highway to the east a mile or two. He and the family recently purchased and settled on a sixty acre farm with a natural stream running across it for irrigation. There the kids can eat fruit, vegetables, drink fresh milk, wade in a damed-up pond of running water and be merry. On off days, when the farm work will permit it, Herb tramps the hills for miles around and brings back jeep-loads of the most beautiful moss and plume agate. That boy knows good rock when he sees it. He should! Herb spent ten years working in a big agate shop—selecting, cutting, grinding, polishing.

A little farther north is Gateway, Oregon. Perhaps you have never heard of Gateway but you have heard a lot about "The Priday Ranch" and its very famous agate filled "thunder eggs." PARR NORTON is the present owner of the ranch. Parr is in "big business." The ranch comprises 52,000 acres, is fenced and is stocked with several thousand head of cattle. Hay is cut and stacked in the valleys for winter feed. Harvesting the hay, alone, is an all-summer's job.

Parr Norton is friendly and is a fine gentleman — regardless of what some folks have thought and said aloud. We had a good visit for Parr happened to have a little time to spare when we dropped by. He stated frankly why he closed the ranch to rockhunters. Of course they had been coming in swarms and had become quite a nuisance. Everybody knew and agreed to that. Then, one day, a fellow came with a big truck and two workmen. The men picked and shoveled the material from the ledge; the boss sampled and selected the best. Picking was hard . . . they could not get rich fast enough that way. A charge of blasting powder was placed and set off. That explosion on private property made by those greedy rock-hogs was the last straw. The ranch has been closed to ALL since. Who of us would have done differently?

CHET KENNEDY, also Gateway, Oregon, is the owner of the 10,000 acre Kennedy Ranch adjoining the Priday Ranch. Poor Chet! We have the deepest of sorrow for that gentleman as a victim of circumstances. Chet is as fine a man as ever wore shoe-leather, straddled a horse, or rode a tractor. He and the entire family are becoming irritable and sad. Why? Because daily—often several times daily—knockings are sounded on the door of their private home way off out there in the open spaces by someone who would like permission to hunt "thunder eggs" on the closed property. When permission is declined, arguments are usually put up by the visitors. Sometimes they become heated arguments; and all too frequently close with the rockhound visitor thinking (sometimes audibly) S.O.B.!

Chet is sensitive and can't figure it out.

Scores of times, in the past when he let everybody hunt, he stopped his work, jumped into the truck and guided the way a mile or more over the hills to where the diggings were.

One day a man found an unusually fine agate on the property. He said not a word to the owner. Did not even exhibit the beauty; rather, he loaded it into his car and drove away. Word of that find came back to Chet in a round-about way. Also word came that the man sold the specimen for $1,000. That information came to Chet from two different sources.

Well! What would you do if you were a hard working ranch owner trying to make an honest living and heard that folks were picking up one-thousand-dollar bills on your property? And not letting you see them even? Nor offering you half?

Quoting Chet directly, he said, "Campbell, suppose you were running a grocery store and had an open barrel of apples. Folks came in, leaned against the barrel, picked out and ate a few apples; then went out without buying anything? What would you do? You would either close up the barrel or the store."

That's "how the geese that laid two golden eggs were killed" by greedy rockhounds.

(Note: We checked carefully, later, several sources that would have known for certain if any agate had been sold for $1,000. We could get no trace of any such transaction. Apparently, the finder of the agate was of the fisherman type who greatly exaggerated the account of his catch.)

JOHN SILVERTOOTH and the MAD AM *are* Antelope, Oregon, just about. Since he was ten years old John has been interested in and has been collecting rocks around Antelope. That's for as long a time as some of us have lived. They know as personal friends every rancher in many surrounding miles. The yard about their home is generously stocked with every type of semi-precious stone from the area.

Here's a secret we uncovered. Dr. H. C. Dake acquired a vast amount of scientific mineralogy through hard study; he acquired a vast amount of practical mineralogy through hard knocks received in company with John Silvertooth on the range. Seventeen years back when the Mineralogist Magazine was just toddling, those two men with their gallant wives spent long hours on the blistering ends of picks and shovels; cooked their food over sagebrush fires; and slept in and under their cars.

For years the Silvertooths drew maps of trails leading to locations for friends and strangers who called—or, if time and work permitted, went with them in their cars and introduced them to the ranch owners. That is all changed today. The ranches are closed and many of the veins have become exhausted. Most fortunate for some of us late arriving rockhounds, Mrs. Silvertooth has been induced to sell some of the fine rough material they have on hand. It cannot be duplicated.

In Portland, Oregon, ForD was most anxious to find THE DAKES, publishers of The Mineralogist, whose interesting articles about rocks and new locations had been the direct cause of our having travelled so many thousands of miles up, down and across the country. They are great folks! Just what you would expect any who have loved the Big Outdoors so long to be like. How could they be different? Our gratitude to them is genuine for having led us on in an entirely unknown field and hobby which has meant so much at this stage of life.

JACK DE MENT, New Fliedner Bldg., Portland, Oregon, is a rare young man. He, as you already know from his many articles, is a gentleman who plays hide-and-seek in his laboratory with those funny, newfangled little devils that may all of a sudden go "plopp!" — and all is over. One fellow told ForD that Jack can pick up an atom by its ears, put it under a gadget in one of those box-like contraptions he has, and tell at a glance what the atom ate for breakfast. (We question that.)

Be that as it may, Jack is mighty busy these days and nights. The Atomic Energy Commission's domestic uranium program providing $3.50 a pound for uranium oxide and a bonus of $10,000 for the discovery of honest-to-goodness new deposits bigger than a barn, has got all the old retired desert-rats stirred up and they are out digging like mad wherever their Geiger counters blink a blink or click a cluck. This stuff isn't like prospecting for gold which could be distinguished from pyrite (fools gold) by a trained eye in the "bad" old days. Prospectors who don't send a few samples to Jack for a quantitive radio-activity assay may be overlooking the one big chance of a lifetime.

Having followed the Columbia River from The Dalles down to its mouth, ForD climbed aboard a ferry and nine miles later was rolling up the Washington bank. On up the coastal highway we went and then west to the very tip of Cape Flattery. That is the most northwesternly spot in the United States proper. For us is completed a visit to each of the four corners of our country.

At Sekin, a little spot on the Straits of Juan de Fuca, we collected a few beach agates; and later we gathered a few more at Agate Bay farther east. They were nice but not exciting.

Around Puget Sound we looped and on up to Vancouver, British Columbia; stopping long enough only to say "howdy" to friends in cities along the way. (ForD, like ourselves, dislikes crowded cities and only goes through them when there is no practical way around.)

Next day it was different. We were headed up the Fraser River valley. But not for long; soon we were in that gorgeous Fraser Canyon. That road is a honey! There is only one other that we have found, any where, that can compare with it—that is the Apache Trail in Arizona.

Construction crews were working on that road in numerous places. On shelves a thousand feet straight up from the river and railroad below, bulldozers snorted and played as they pushed huge boulders blasted from the solid mountain shortly before. Around them ForD found her way.

Nowhere along the hundred-mile stretch, even beside the one-track passages, was there that psychological devise we call a "guard rail." The country is too thinly settled to afford them. As it is, much of the road building is costing from 200-to-350 thousand dollars a mile, we were told. That is easy to believe.

There must be a lot of very beautiful rockhunter's material up among those Coast Range mountains. We had intended to look for some of it at promising spots. There were no suitable places to stop and park where indications seemed likely. ForD had to keep going for other cars and trucks were behind.

Swinging east to Kamloops — a very nice city—and then south again at Salmon Arm, we paralleled a long string of narrow mountain lakes which extend to the U. S. boundary. The British Columbia trip covered about 625 miles. Someday, somebody is going to find a lot of nice cutting material up that way. An astonishing fact printed in a Provincial folder is that British Columbia in area and extent about equals the states of California, Oregon, Washington and one-half of Idaho. That's BIG!

Coulee Dam, Washington, across the mighty Columbia River, is a man made wonder—perhaps his greatest accomplishment in all time. Even a brief description is impossible. The "Grand Coulee" and the "Dry Falls" are something else again. The dictionary says: "Coulee—a deep gulch, usually dry; distinguished by its inclined sides from a canyon."

Imagine, if you can, shutting off the water at Niagara Falls tonight and driving up the gorge tomorrow. Make the gorge a thousand feet deep, several miles wide and 150 miles long — that's Grand Coulee — the course of the Columbia River during the retreat of the ice age.

Dry Falls is Niagara without the water on a scale of about 40 to 1. What a mighty cataract that was! The world's greatest of which evidence has been found. The plunge was 400 feet; the face 4 miles across. The basin worn in the solid volcanic rock below the falls is still filled with water and forms a lake of considerable size. What changed the course of the Columbia River 50 miles to the north and west is a geological mystery for rockhounds to ponder.

Mack's Agate Shop, 6205 Columbia Ave., Kennewick, Washington, is what the sign says. Be careful with that "Mack" stuff . . . you'll be standing on the wrong foot. C. H. McELROY and E. A. EBERLY are the bosses around there. (They think they are; but they are not.) The two wives do the cutting, polishing and selling of the beautiful specimens. The two men have a saw and lawn mower service. That's where they are wise. With rocks alone some folks don't always eat.

Ever hear of "old" GEORGE W. WEBER, 1320 Portland Avenue, Walla Walla, Washington? He's just a grown up kid. His chief claim to being "old" is that he's the No. 1 man on the list of Charter Members of the "Old Timer's Club." Of course George did sit around the Post Office in Walla Walla and read post cards for so many years that they finally tossed him out and gave him a pension. When a fellow gets so fat (or lazy) that he cannot go out, bend over, and pick up a few nice rocks, he becomes an "Old Timer" who remains home by a fire and writes letters to other "Old Timers."

D. R. IRWIN, 381 Chase Avenue, Walla Walla, Washington, is a builder and contractor who somehow found a keen interest in rock specimens a short time back. He took up hunting, cutting, polishing and displaying with a vim. What that man has accomplished in a short time is astonishing. Being a builder, the cabinets in his home are works of art.

JOHN and WILMA HENNER, Haines, Oregon, keep other people's cars supplied with gas and spare parts. That job keeps them pretty busy especially during the tourist season. They both are of the type that will not be fenced in; so they frequently go into the Elkhorn Mountains on collecting trips. Some of the beautiful specimens that they have brought home and used in building rock and flower gardens should be in museums. Now they are going into cutting and polishing and are building their own machines in the garage.

MRS. W. E. WARFEL and her sister MISS MAMIE CAVIN, 1768 Valley Avenue, Baker, Oregon, are two of the most remarkable rock enthusiasts that ForD has ever hunted out. What those ladies have accomplished with the hobby in spare time is beyond belief. First; their skill and endurance in driving to isolated locations and their patience in searching is remarkable. The basement of their home is filled (and we mean FILLED) with excellent material that has all been scrubbed with a steel brush, soap and water, classified, and placed in bins or nitches. Second; with an eight inch saw and home-built sanders they have cut and polished, not only hundreds of magnificent cabochons, but many slabs and flats that are beautiful. Third; they set aside a room on the first floor in which they installed glass cases and shelving so that their splendid collection may be seen easily and enjoyed by visitors. Iris agate is perhaps their specialty. Their display of cabochons cut from Iris agate took a blue ribbon at one of the shows.

Central and eastern Oregon is by far the most interesting rockhunting country that it has been ForD's privilege to visit. The rectangle between Bend, Burns, Baker and Antelope is scattered with spots where a good day may be well spent. At Baker ForD had thought that she was headed east. But she was not quite satisfied to leave. She hadn't seen the big and famous John Day River basin. ForD is always right. So up logging roads over mountains, past miles of placer mining debris in the back areas, we headed west once more to the Middle Fork of the John Day River.

Near Whitney a find of good petrified wood had been made. The location had been hunted over thoroughly but we obtained a few nice pieces. Around Sumpter, a profitable week could be spent looking over the miles of placer material that may reveal anything. From near Greenhorn is found the Temskey Fern Wood which is fast becoming very rare.

Not far down the road below Bates, Oregon, (a lumber mill settlement) live THE DE WITTS in a grand log house—the best in miles around. The De Witts are rock collectors de luxe. They have brought home only the best. It was Saturday and company was coming for the week end. When Mrs. De Witt answered our knock the tantalizing fragrance of baking spiced pies filled the air. How can anyone talk rocks under such circumstances? It is but a mile or so up back of the ranch house to where the "Chinaman's Diggings" were located. There the Orientals once worked placer on a small scale. Only a short time back was it discovered that much of the waste material was excellent agate. Those piles have since been gone over with the aid of fine-toothed combs. Still they are worth seeing.

Farther on down the river lives MRS. LENA B. DUNSTEN, Susanville, Oregon.

Mrs. Dunsten is one of the sweetest elderly ladies that ever loved rocks. Of Swedish extraction, her husband while living, was a mining engineer. When time has permitted throughout the years Mrs. Dunsten has roamed the hills and river shoals and picked and brought home "the beautiful." Today her garden is massed with that material. Her collection of limb casts is unusually fine.

Up the side slopes of a feeder stream running into this Middle Fork of the John Day River is where "Lady Luck" paused and beamed a smile. Our return courtesy was so profuse that while we were bent low our eyes spotted an agate slightly exposed in a very small eroded area. Carefully digging away the surrounding hard clay with our pick hammer, we uncovered an agate as big as our head. (Quite naturally our head swelled fast immediately.) That rock was the best find of our lives. It weighed 28 pounds. Two-thirds of it was a deep greenish-blue plume and the other one-third clear agate. There are some choice horizon pictures in it. A half dozen good agates were also recovered from the stream bed—one a water-worn 4 inch limb cast five inches long.

THE PEARSON BROTHERS, Galena, Oregon, as rockhounds in that area are comparable to Kit Carson as a scout in New Mexico. We were told that these gentlemen have thousands of beautiful cabochons and polished specimens that are entirely and completely the results of their own efforts and skills. They even made and impregnated their own saws "way back there in the long ago." Greatly to our regret and loss ForD missed the turnoff trail and we were far down the river valley before we knew. In that back area there are few if any road signs.

If some parts of the United States only had the magnificent John Day River basin scenery how their Chambers of Commerce would shout from the house tops about it. The ranchers who live in the region, apparently, are busy making a good living. They don't talk much. The pastel tints of the eroded cliffs, viewed with a setting sun, presents a foretaste of heaven. For mile after mile the views are beautiful. The Painted Desert National Park will have to look to its laurels some day. A good state road follows the river.

JAMES D. FINE, Spray, Oregon, the barber, is a rockhound. Jim may try to scare you at first. Don't let him. He'll warm up. Then he may show you some nice material. Jim had just returned from a hunt and had not had time to remove his big boots when ForD happened along. Uranium is in that fellow's blood; for he would like the feel of the $10,000 bonus Uncle Sam has been talking about.

Fossil, Oregon, is well named. That's the home stamping ground of those little fellows. MARTIN PEEL is another barber. (Seems like all of the barbers up that way have taken to rocking.) This gentleman and his good WIFE are taking their new hobby seriously. Equipping themselves with a brand new four-wheel-drive covered jeep, beds and all, they are prepared to go and stay in the wilds almost anywhere for a day or a week. Opal Butte, or Parker's Mill as some call the spot, up south of Hardman on state road 207, is not too far afield. From there they have gathered a good supply of those choice "thunder eggs." And they also have a lot of other fine agate in the rough in the yard.

DR. CHESTER ARNOLD, Paleobotanist, University of Michigan, Ann Arbor, had been working in the area. During our stay at Bend, Oregon, the newspapers had carried accounts almost daily of the movements of his expedition out for fossils in general and Osmundites in particular. There we had been trailing him by two days. At Antelope we had again crossed his trail a day or two late. Working into Antelope from the east this second time, we stopped at his deserted campsite. However, we did not go to his location. Scientific studies like his should be private and not be messed up by ordinary rockhounds.

Three weeks earlier, while at Antelope, luck had rewarded our perserverance. While roaming the hills outside of Antelope broken fragments of chalcedony had been observed in small washes. Those were signs. Under a broiling sun well after midday, on a hillside, we came upon an original find of "thunder eggs." The surface appeared much like a cinder dump excepting that sagebrush was present in plentiful quantities. The area was about 100 x 150 feet in extent.

Boys and girls — that was an experience! There they were undisturbed; . . . little and big . . . broken and sound . . . two or three hundred in plain sight on top of the ground. The old "thunder bird" must have just left the nest for the eggs were plenty hot. Sampling by nicking an edge, we discovered that about one-in-five of those on the surface were agate filled. Some were geodes and others nodules. We had taken about a dozen of the eggs at the time.

To be honest with ForD, we admitted

that it was to just once more visit this "find" that we had returned. There they were exactly as we had left the area. This trip we dug eggs with the pick from below the surface and made our selections with greater care. About fifty were brought back to Michigan. Some have been sawed and showed beautifully formed geodes and other nodules.

At another spot about which we had been told, along a back roadside in the Antelope country, we unearthed with the pick a dozen or two "thunder eggs" of an entirely different type. These are called the "Donnybrook." Ours have not been sawed as yet, but samples indicate that they are very pretty.

That John Day River valley was so alluring that ForD back-tracked up it to Dayville and then cut south to Burns. At Buchannan, 22 miles east, we sought the Mineralogist "Preen Thunder Egg" location. (May, 1943.) Of the four digging spots, we found the one on the brow of the hill to the east the most productive. Picking those babies from the formation was quite like digging potatoes. They were funny little fellows! Some were in clusters just like badly sunburned potatoes grown together. In one bunch about the size of two fists we counted twelve eggs grown enmass. We did not save such specimens for one would weigh as much as 15 pounds; too heavy to bring so far. For every one we selected and kept we left about ten piled nicely on the bank. (Someone may come along who does not have a full sized pick.)

Over north and west of Weiser, Idaho, about ten miles, is another agate location. There is found "snowflakes" and "winter scenes" in clear agate. The big hill on the right side of the road has been picked clean. An hour's tramp produced nothing worth keeping. Several miles farther north in a rolling stretch that do not look at all promising, sagebrush everywhere, we spotted here and there several good pieces of clear agate messed with white — the kind that when cut make those lovely winter scenes.

EARL M. VAN DEVANTER and his rare WIFE, the "rabbit king and queen" of Caldwell, Idaho, live at the edge of town on route 6. Earl and the "queen" take in all of the rock conventions held anywhere in the west. They were at Denver. When ForD pulled into the yard, HERBERT A. ENOCHS, 601 Ash St, was there and they were completing plans for an early departure next morning on an opalized-limb-cast hunt. We piled in and had a great day. Up in Payette, Idaho, we stopped around for JULIAN M. FIELD, 422 Loth St. Julian prints the Sundail, a paper that gives a lot of inside information about rockhunting. Only the "select" are on his subscription list.

Julian had been to our objective spot up north of Vale, Oregon, some ten years back. Ten years is a long time in a big country like that. It was a hunt in dead earnest. But with Herb Enochs at the wheel nothing is impossible. We found the old corral and the remains of the watering trough... and there on the hill beyond were the limbcasts as per schedule. It was very interesting material.

At last ForD was heading east and this time we did not try to talk her out of it. The Craters of the Moons National Monument was at the roadside. We drove through and saw much of the fantastic, twisted lava formations. What a jumble! On east through Yellowstone we only paused to collect a few specimens of sinter—"geyserite"—from the faces of Old Faithful, Cauliflower and Castle Dome geysers; all differently formed; all pretty and interesting in their own way. On east to Cody; over the Big Horn Mountains where we had been snowbound in a blizzard two years before; across the vast northern Wyoming stretches to Devil's Tower National Monument . . . There's a marvelous laccolith for your specimen case! And on into Deadwood, South Dakota.

Around Custer in the Black Hills of South Dakota there are more rockshops than we have found in a like area anywhere — there must be at least ten. Most of the material displayed is of a bulky nature. It is especially suited for fireplaces, gardens, etc. Wonder why such names as "Calamity Peak," "Gold Nugget," "The Cycad Shop," to mention a few for illustration, are used and the owner's names are completely omitted? Does Custer do a "one purchase only" business?

MRS. FRANK SCOTT, the daughter-in-law of the original owners of Scott's Rose Quartz Mine, stated frankly that they are not getting any "gem quality" material from the mine at present. The mine is being worked and the vein is being followed in the hope that any hour may bring to light another lot of the pure, crystal-clear rose quartz.

Mt. Rushmore National Memorial in the Black Hills, South Dakota, is of particular interest to rock hunters. The heads of Washington, Jefferson, Lincoln and Teddy Roosevelt are from 60 to 70 feet in height. Carved from the solid granite of Mt. Rushmore, it was estimated after completion that the memorial would endure for 100,000 years. Sorry to report this! Vertical cracks on the heads are appearing. One, on the face of Washington, extends from above the right lip on up over the forehead. It is visible to the naked eye; with the field glasses it is shocking.

Cutting southeast across South Dakota, ForD shied to the north in Minnesota and in Wisconsin in order to set her four feet once more in Northern Michigan. There we renewed our gift supply of specular hematite, jaspalite and "bog iron" limonite. Home for ten days digging dandelions — (It's more fun to dig rocks) — and we were off again.

The Midwest Federation of Mineralogical Societies convention was on at Davenport, Iowa. We had promised OSCAR ANDERSON, the ranch boss of this big- hard-riding, midwest outfit — when we were both in Sacramento — that we would be over and see his show. Oscar knows how to make things click. Nobody loafs when Oscar is running a roundup.

ForD was highly honored on that jaunt. WILL BERESFORD, a trustee of the Cranbrook Institute of Science at Bloomfield Hills, Michigan, with MARTHA BEARSFORD as guide and councilor, made a merry carfull. Will, once having resided in Atlanta, Georgia, missed the championship in eating watermellon by a narrow margin.

TOM ROYSTER, 1182 Hershey Avenue, Muscatine, Iowa, knows where the Lake Superior type banded agates may be found in the gravels of the Mississippi River. Tom guided a large group from the convention to areas south of town, obtained permission from the owners for us to hunt, and then turned us loose on the dumps of coarse washed gravel. That was the easiest rockhunting we had ever done. Step out of the car and go to it . . . a little dirt on the hands . . . a few sandburs in the socks; nothing more.

ForD was given a "red-hot-tip" about another gravel pit outside of Harper's Ferry, Iowa, 200 miles to the north. Will Beresford and ForD reasoned, "200 miles upstream! the agates should be just that much larger.." Martha withheld council. Early on the morning after the convention we were off. By one o'clock we were on the dumps. Not a single, solitary agate was seen. Somebody had them all — if any?

Crossing the Mississippi River eastward we were in Wisconsin; dropped south a bit and picked up the valley of the Wisconsin River. Up that to Portage; then the head waters of the Fox River and down to Green Bay. That is a most interesting journey for it is the reverse route taken by Louis Joliet and Pere Marquette with seven men in two birchbark canoes in 1673 on their way down the Mississippi. Into Northern Michigan and back via the Straits gave us 1,790 miles for the five days.

This summer's was a great rockhunting trip in the northwest. It was the best trip of a long lifetime. Nine full weeks—11,930 miles total. The northwest is a fascinating country. Perhaps those who live there do not fully appreciate what they have. They may be too close to the picture. Up the Redwoods Highway in California ForD complained that she could not see the forest because of the trees.

# Montana

## The Moss Agate State

Among the gem cutters and gem hunters, Montana is best known for its moss agate, found in the gravel beds of the Yellowstone river, and the adjacent regions. For more than 75 years Montana moss agate has been a standard item in the jewelry trades, hence much of this section will be devoted to this popular material.

Montana is also well known for its superb cornflower blue sapphire. However, this gem is not likely to be found by the casual gem hunter. The sapphire is recovered in a commercial manner by the use of huge dredges, and similar placering operations. This material is well known in the gem trades. Visitors to Montana should by all means see the splendid collections in School of Mines at Butte. This superb exhibit will serve to give an idea of what has been found, and what is available in the state.

The accompanying map gives a rough approximation of that part of the great state of Montana where the famous moss agates may be encountered. This region comprises a strip of land some 300 miles long and from a mile or two to twenty miles or more in width. In a general way it parallels the Yellowstone River, being south of it above Miles City and to the north beyond that city.

These agates evidently originated not far from the point where the Montana-Wyoming boundary crosses the Big Horn Mountains, and were transported by hydraulic action down an ancient river, the bed of which lay within the strip of agate-bearing gravels. In time these gravels persisted to become bench gravels, while the terrain on either side eroded away. So effective have these bench gravels proved in resistance to erosion that the cap of so-called Shepp Mountain is nearly a thousand feet above the present level of the Yellowstone.

It is more or less useless to hunt for these agates except within the area shown on the map, and even here they are found only in limited patches, mainly about the higher gravel bluffs and in the gravel bedded washes below them.

One collector is reported to have followed the disastrous flood which a year or two ago undermined the Milwaukee Railway viaduct across Sucker Creek, and within three days gathered up 800 pounds, many of the stones of first class quality. Over a period of several years prior to the flood, Sucker Creek wash had not yielded a hundred pounds of good agates all told.

Montana agates can, however, still be obtained in quantity for anywhere from ten cents a pound to a hundred dollars an ounce. One should in no case invest in the high priced stuff until he has learned to get the best out of a stone. I remember that I have lost good friendships because the material I sent in exchange was carelessly or improperly opened up.

E. S. Bateman of Seattle, Washington, and a former resident of Montana, has made numerous visits to the moss agate regions. He presents here an excellent account of the agate deposits, and various places of interest along the route from Seattle.

"Look, Herman; come here and see how some agate hunters waste fine nodules," called the writer as he came to a large rock embedded in the hill top, that was covered and surrounded by a plentiful supply of fragments of chalcedony, etc., crushed and broken beyond any possible use. Examination by both of us showed that many fine agates had been wrecked to satisfy some vandal's idle curiosity. It was inconceivable that anyone who was even superficially acquainted with the proper methods in telling a fine agate from a poor one would show such an utter lack of common sense. By smashing a nodule on the large rock they defeated their purpose, as a few trials should have shown that the finest agates shatter into fragments much easier than the poor ones.

Ever since the writer met Herman Graff, who, perhaps is better known by, and perhaps gives the best description of himself, as, "The old retired Montana school teacher." Several years back we had planned and talked over about going back to his old stamping grounds and agate haunts in eastern Montana. But one thing or another had caused us to postpone the trip, until we finally settled on mid-July of 1947.

Finally everything clicked, and with the "Agate Special," that faithful old bus that has helped to create the "Saga" of this rockhound's wanderings to and from the agate fields of Eastern and Western Oregon and Washington, fully equipped for living either in or out of doors, we sped away from Seattle eastbound with those famous moss agate beds of Eastern Montana as our goal.

There are so many who have never made this eastbound trip from Seattle, with its marvelous scenery to be seen and the historical points to be noted along famous U. S. highway No. 10, that it would be manifestly unfair to skip entirely a brief description of that part of it that we passed over and the wonderful and beautiful countryside and the cities that we saw and were conquered by. For this great modern road bisects the Pacific Coast and the entire western portion of the United States, providing an infinite variety of instruction and entertainment to the passing motorist.

Long, gentle grades, perfectly engineered around perfect curves and straightaways, carry the motorist ever higher into the Cascade mountains, through natural scenes of entrancing beauty, and awe-inspiring grandeur. Leaping, dashing creeks and rivers, placid lakes, tree-clad mountain slopes meet the eye on every hand, causing forgetfulness of the steady climb until without warning we slide easily and smoothly over the summit through the famous Snoqualmie Pass.

Gliding rapidly along the banks of the turbulent Yakima river and through the sweeping beauty of its great canyon, we reached the prosperous city of Ellensberg, center of one of the richest stock raising parts of the state.

Our fast, steady pace rapidly ate up the miles through the grain fields and grass lands, where the white-faced Herefords stupidly stare as we flash past. Then down the long winding reaches of the highway, through the rugged sagebrush covered basalt and rhyolite cliffs that once so effectually concealed the famous Russell Petrified Forests, that of recent years have been partially uncovered and preserved in part for the education and pleasure of all who pass that way in the famous Gingko State Park, with the museum and display, where the agatized remains of ancient forests variously estimated at 15 million years old, cut and polished into specimens of glorious beauty, are on display for all to see, study and admire.

A rugged, rocky, rolling country was encountered with large fields of surface lava or basalt, alternating with rapidly maturing wheat, reaching right up to Spokane, the largest inland city in Washington, which we passed through and left behind, as our speed increased along with greater riding comfort upon the perfectly paved four-lane super-highway that crosses the state line into Idaho, ending at the fine city of Coeur d'Alene.

After leaving Coeur d'Alene, scenery of a wild and rugged beauty was constantly before us as we skirted lovely Lake Coeur d'Alene for miles until we passed over Lookout Pass in the state of Montana.

The beautiful Clark Fork River canyon furnished a water level grade for highway No. 10, along which our fast-rolling wheels brought us into the beautiful city of Missoula in the early evening where, after a hotel had failed to receive our wire for reservations, a quick check over other hotels found us settled down for a well-earned sleep.

Up and away at 5 the following morning we still followed the Clark Fork river as it flowed steadily eastward, passing the highway junction town of Drummond, and turning south at Garrison, we sped rapidly past the grim walls of the State Penitentiary at Deer Lodge, with the usual old jokes about it being our future home unless we watched our step. (Ed. Yes, we have a subscriber here.)

Looming up against the skyline the huge smokestack of the Anaconda smelter was clearly to be seen as we swung east and away towards the city of Butte, which we slowly entered while gazing on all sides with deep interest.

The far-famed Montana School of Mines was observed high up on the hillside on our left as we passed through the city, not far from the old Boot Hill cemetery, so well and unfavorably known to the old timers, many of whom were planted or buried there, literally with their boots on, as the result of a hanging, "shoot out" over wine, women or song. Who knows!

Rolling ever eastward, we thrilled at the sensation of crossing the famous Continental Divide and over Pipestone Pass at an elevation of 6418 feet above sea level that we had left such a short time before, and the "Agate Special" fled rapidly along the highway into Gallatin valley, with its interesting historical points of interest, such as the Lewis and Clark cavern, where an eagle flew into the face of a mountain one hot afternoon of the summer of 1902, with Dan Morrison watching while prospecting, and when the bird failed to appear causing him to investigate, resulting in the discovery of the famous caves.

Entering and rapidly leaving Bozeman, the city that was named after that famous pioneer and Indian fighter, we passed by the Montana State College on our right, and the old abandoned Fort Ellis on our left, rapidly climbing over easy grades to and over Bozeman Pass, elevation 6002 feet, and sped rapidly east down long smooth grades twisting and winding through the mountains finally entering the lovely little city of Livingston, which lays at the upper end, or western beginning of the valley of Yellowstone river, that great flow of water that emerges so suddenly from the mountains, turning eastwards through its famous valley and finally uniting with the equally famous Missouri river near the eastern border of the state.

We were now entering the western edge of the moss agate district of the Yellowstone and our interest quickened as we sped down the valley, with frequent views of the Yellowstone river on our left, and a fine farming country spreading out on every hand as a welcome change from a steady diet of mountain scenery, and geological structures upended at all points.

Sliding swiftly along the valley we came to the town of Big Timber, where Herman Graff had resided for many years, completing the second leg of our trip, and finding hotel accommodations of the best awaiting our convenience this time, and as a welcome change.

Many fine types of agate can be found a few miles from this city, as Herman Graff collected for years there.

Away to an early start the next morning we took off on the third and last leg of the long trip, with Terry our objective, 293 miles away.

Moss agate country now extended on our left hand, or to the north, to a depth of around 50 miles, with good prospecting to be had with better hunting off the beaten track, and especially in the Lance formation, that is to be seen everywhere.

Rolling into the live wire city of Billings, we paused only for a quick gas-up and lunch, starting away with but small loss of time. This hustling little city is the center of a big moss agate territory that has apparently escaped the attentions of most agate hounds.

While the temptation was strong to tarry and prospect here, especially in the country to the north, we resolutely pushed on towards Terry, our journey's end, and Herman Graff's old stamping ground.

Miles City, named after that famous Indian fighter, General Nelson A. Miles, was only a temporary slow-down. We would have liked to stop and foregather with fellow rock hounds there, but the afternoon was rapidly passing so we figured that we had better tackled the 80 miles to Terry. Our two-room apartment, located in the basement of a private home, was the coolest place in the valley that we encountered during our entire stay in the state. We were truly fortunate in comparing our diggings with the hot, sweltering hotel rooms that other hunters of the festive moss agate had to put up with.

The next item on our program was to organize our hunting on a systematic basis. We realized that there was too great a territory to cover in the limited time available to even try to visit all locations in an area extending eastward from Livingston to Sidney, and probably 50 miles in depth. So we started out bright and early the next morning along the road running north from Terry across the Yellowstone river. Arriving at the river and crossing to the north, we found that highwater water had covered all of the beaches but a narrow stretch of gravel that had been worked over recently, but by carefully working the gravel we found a few poor agates.

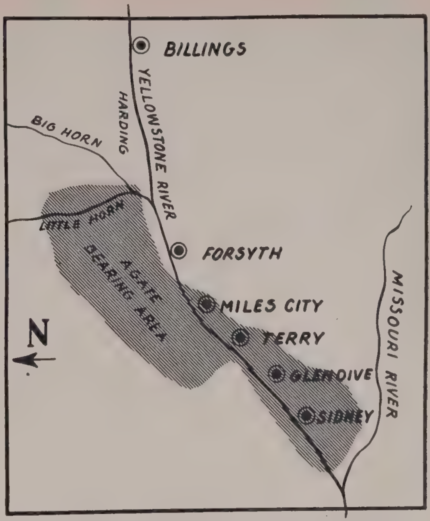
Then back to the car and away for the creek bottoms north of the river. This region contains some of the most unusual as well as beautiful examples or types of erosion in sandstone and scoria to be found anywhere, and on this road a large area on both sides can be seen and inspected without permission from owners. Weird shapes, symmetrical columns, to heavy towers, etc., are mixed in together in bewildering confusion that will gladden the heart of any student of geology.

Emerging on top of the level to rolling bench that is designated by geologists as a plain, stretching for miles parallel to the Yellowstone, we swung to the right on the first well-traveled road, arriving at Cedar Creek gravel bars at the ford. Prospecting both ways from the ford with unsatisfactory results, we wondered if the rumors that one professional local collector had worked these extensive bars over with a bulldozer was not correct, and that he had anticipated the normal release of the agates contained therein by many years. Not much time was put in here when it became evident that the pickings were very poor, so we pulled out after prospecting about a mile on the east side of the creek, returning to the main road, where we parked and prospected the rolling hills in all directions. Finding very little we entrained for points farther back into the hills where we figured the average rock getter would be unlikely to go. This worked out much better, and we spent several days combing the creeks, gravel pits and hills with good results.

Many of the ranchers are enthusiastic agate hunters, who have large amounts of good, bad or indifferent quality agates for sale at varying prices. $1.00 per pound might run as an average for field run agates which, in the writer's opinion, is high, as field run material that has been collected by anyone other than an experienced collector, is sure to run high in worthless material.

We high graded continuously in the field and again after returning with our booty to our abode. In the writer's opinion, no rancher having the selling of his agates in mind, would be willing to do this even if he had the knowledge to do so, and from what we could find out, the rancher did work off a lot of poor to worthless material on beginner rock hounds weary and tired from hunting over large areas and not wanting to return home with little to show for the trip. It is here that judicious use of the silver pick helps a lot, if one knows the score and can out-talk the ranchers into permitting more or less high grading of their piles. This has to be done very diplomatically, as they become irritated easily and will suddenly drop negotiations, refusing to make a deal in any way. One very useful approach in opening the dealing is to make a present of a silver ring to either the rancher or his wife, as a token of goodwill. We figured the psychological approach would place them in a position where it was difficult to deny us access to their agate piles, and if we were willing to pay, the amount was simply a matter of dickering. A comparatively small amount was picked up by us in this manner, and none of fine quality. It is difficult to trade finished jewelry to the ranchers. They are nearly all well supplied with silver jewelry with moss agate gems of more or less beauty. A few have gold mountings and beautiful gems that grateful rock hounds have sent them after returning home. However, it was observed that in proportion to the number of agate hunters who received favors at the hands of the ranchers, the number who showed gratitude was relatively small.

Next to finding fine agates in the field, our greatest enjoyment was in discussing the geological formations, methods of agate formation and deposition, etc., in the areas covered each day, comparing the written findings of authorities of more or less experience with our personal observations in the field. As one example, we plucked moss agates from the face of a conglomerate high up on the steep hillside and in the Lance formation, where the agates with the accompanying water-worn rocks were originally laid down and eventually cemented together into a compact mass of medium hardness.



MONTANA MOSS AGATE

The Lance formation is very widespread in Montana and adjacent regions, and is regarded as being in the upper Cretaceous age.

Practically all, if not all, of this type of agate is found in the Lance formation. The adjoining Livingston formation also contains clear chalcedony nodules of identical appearance, but lacking in the distinctive moss bands, scenic, etc., markings that make the dendrites, things of beauty and a joy forever.

In the vicinity of the city of Big Timber in Sweetgrass county, the basal Lance merges into the Livingston formation, which is comprised of the Lower Lance and the regular Montana group following. The marine Bear Paw formation is about 250 feet thick, and the next lower, the Judith River formation, is about 600 feet thick, having been laid down as a fresh water sedimentary. Next below we have the Clagett formation, which is about 200 feet in thickness, and the upper part of the Eagle standstone formation, all are included because, during the deposition of these various formations in this particular area, considerable amount of volcanic material was deposited in these sedimentary formations above mentioned during the period of deposition.

In the upper part of the Livingston formation, and particularly that part which correlates with the Lower Lance, the youngest horizon contains chalcedony nodules, a few of which show mostly black dendrites.

It is not illogical to assume from a geological standpoint that the volcanic material came from the Yellowstone Park region, and may have been carried as far east as the Glendive area. As a possible but less probable alternative, this volcanic material may have originated in the much older Black Hills uplift, which is a worn down range of mountains of greater age than the mountains in the Yellowstone Park area. As an additional indication, the writer and Graff found that some of the standstone beds consisted of conglomerate incorporated therein, with this conglomerate consisting of quartzite nodules, some of which were clear chalcedony, dendritic nodules, and petrified wood. We also found that very fine grained chert, jasper and flint were present.

Those who might claim that this type of agate was carried southerly from the great glaciers of the north, are refuted by the fact that the southern boundary of the great northern glaciers, as shown by the terminal moraines, did not extend appreciably south of the present and former courses of the Missouri river.

One earnest and thoroughgoing scientist states that agates are formed in cavities in volcanic rocks. That, in the escape of gases and vapors from such rocks on cooling, cavities similar to those seen when pasty substances are heated, are often formed, and remain open when the rock is cooled. The cavities are usually round in form, or more specifically, are often shaped like an almond, whence the term amygdaloidal. The size of these cavities is often about that of the almond, but they may be much larger. It is in cavities like this that agates are chiefly formed, occurring as a filling that takes the shape of the cavity.

Being a tough and resistant material, the agate masses, deposited originally in cavities in certain igneous rocks, will survive weathering long after the mother rock is completely disintegrated by the elements of erosion. Hence we frequently find agate masses in surface soil debris and in stream beds often far removed from their place of birth.

Good prospecting areas start from Livingston, Montana, where the Yellowstone River emerges from Gunsight Pass, flowing easterly. Roads going northerly along or close by any creek, crossing Highway No. 10, and reaching back into the rolling hills, will lead the observing and persistent gravel picker to prospecting grounds. Experienced agate collectors claim that the hill country on the north side of the Yellowstone, is better hunting than that district on the south side. The area around Billings has apparently not been worked as closely as that district on the north side of the river from Billings to Forsyth to Miles City, to Terry, to Glendive.

Following the highway across the bridge at Fallon to the north bank, Cottonwood Creek can be reached by turning left on the first well travelled road at a point about three-quarters of a mile from the bridge, and leading up into the hills, parking the car beside road just before the high plateau is reached, and, a hike over rolling hills, that once were good pickings, several miles to the creek.

Back on highway No. 10, and rolling east many creeks such as Upper Brackett, Cracker Box, Dry Creek, Clear Creek, and others offer unlimited prospecting, until the fork is reached just before entering the town of Glendive. Turn left or north at this fork onto State Highway No. 14, and further on State Highway No. 18, where many side trips can be made until the town of Sidney is reached. Many rockhounds have found or been tipped off to virgin agate beds in this large area, from which they report rich harvests each year, some of which are the finest that the writer has ever seen.

There is one location that is a sure source of all types of moss bandings, etc. agate if visited before local collectors get there in the late spring. To get there follow State Highway No. 14, north of Glendive, turn off on the left or west, on heavily used Deer Creek gravelled road. For 5 miles along this road it is difficult to get to Deer Creek across private property, but beyond the 5 mile point, numerous opportunities to get to the creek gravel bars can be taken advantage of. The writer secured some fine banded agate on this creek in July that had been evidently overlooked as the creek was picked clean of finer agate by the early birds. The spring freshets will undoubtedly liberate a lot of fine material for those getting onto the bars at the first opportunity. It should pay to use hip boots when the water gets low enough.

It was distinctly humorous to observe a local agate dealer standing in the water of the Yellowstone River, about 3 feet from shore, scrubbing away industriously on the rocks with a stiff broom, supposedly on the theory that when the river dropped during the night, the rocks would be uncovered in the morning and he could pick up the agates where they lay, but, the river fooled him completely by rising still higher the next morning, to his great disgust.

Along the Yellowstone River is the last place to hunt agates mainly due to the early season activities of local collectors. Long distances up to about 50 miles north from the Yellowstone are a much better bet, especially if musually satisfactory arrangements are made with the local ranchers. There is some Government land within this limited area, but very little agate is reported to have been found there. Access to these lands is quite likely to be had only after crossing the ranchers' property. So the best bet is to buy or talk your way past the ranchers to the happy hunting grounds.

Of course one can always fall back on the good old well known silver pick method with the ranchers, and get good to fine material, according to the rock hound's ability to drive a bargain, at prices from $1.00 per pound for field run, which term is vague as there is such a variation from what one collector calls fields run, or, what a rancher who picks up and brings in anything that even looks like an agate, and, what the buyer rockhound expects and hopes to get in good cutting material.

Depending upon the buyer's knowledge, and ability to judge quality, if the agates are chipped or show proper clarity and markings, the prices were found to range from $2.00 to $10.00 per pound, with individual nodules bringing "skyhigh" prices. Unusual and rarely beautiful slices are reported to sell around $100.00, with finished cabs mounted or not, often exceeding that figure.

Attention is called to the fact that one can often buy to better advantage from the supply houses that offer Montana agate in the pages of current mineral and gem journals, than on the ground purchases in Montana. There are obvious reasons for this. Moreover, those who are not familiar with grades and qualities of this material will do well, in buying, to deal with a supply firm, since they are familiar with grades and values.

We had been away from home for some three weeks, which is a long time for a married man to be away from home. A telegram, worded short and sweet, helped us to make up our minds that all good things and times must have an ending. So we gathered up our booty, made rounds of our friends for last farewells, and in the cool of the morning we pointed the old "Agate Special" west.

Bowling along at a comfortable 45 miles per, our bus riding low on the springs under the load of well earned booty; with our minds at rest, and our contentment complete, we contemplated the cutting of the hard won bags of agates lying so snugly on the car floor.

There was one stop that we made sure of at Miles city, to call on our good friend Ralph Harris, who has long operated the Montana Gem Shop, and now employs two assistants. We greatly enjoyed a long talk with congenial Ralph Harris, who through his long residence here, told us many interesting things about Montana agate, and the collecting of same.

Pulling out without further visits, we faced the long hot grind up the valley of the Yellowstone, with the scenery consisting of a similar type but always varying, we finally reached the comparatively cool city of Big Timber in the late afternoon, made a round of visits and hit the sack for a rest that satisfied.

Up and away at 7 in the morning, we turned on the speed until one of the unique historical points of interest just before reaching Billings was reached at Pompey's Pillar," a huge tower of the natural sandstone, eroded by centuries of wind, frost, rain; standing alone on the level valley of the Yellowstone. Named by Captain William Clark in honor of one of the most faithful and energetic members of his expedition.

Our flying wheels bore us ever deeper into the narrowing valley, with ever rising grades until after leaving Livingston where the Yellowstone turns abruptly south thru Gunsite Pass, the mountains closed in on us completely, and we could not better describe our impressions than by breaking into a joint verse,

Rocks to the right of us
Rocks to the left of us,
Limestone ahead of us
Splintered and sundered.

We knew the reasons why
Rockhounds race madly by,
Formations twisted all awry,
In sans agate contortions.

Just out of Butte, we elected to take the Anaconda fork of highway 10, running past the huge smelter, everything being dominated and dwarfed by the gigantic smokestack. The enormous dumps, slag, and tailings surrounding the smelter were on a scale that matched up with the surrounding mountains in size and shape. This smelter, said to be the largest in the world, has operated continuously for an ordinary lifetime, and challenges the imagination to conceive the great flood of wealth it has poured out, as well as the tremendous tonnage of ore that has been dumped into its firey bosom.

We reached Missoula at the end of the second day in the "Agate Special," and knew that there simply had to be a lapidary shop in this town, where perchance we could talk shop with the owner. It was past business hours, but we located a shop, and while lingering, and gazing at the window displays, the owner, Mr. Ulrigg, happened to return to complete some special order. He kindly invited us in after we had made ourselves known. Incidentally he did not get around to his special order that evening.

Buzzing along the next day, we soon entered Spokane, and after a short visit at the fine local museum were again on our way over the rolling hills to the famous Coulee Dam. No words can adequately describe the feeling of awe experienced when viewing that stupendous dam and waterfall, reported to be the largest man made structure ever built. We could believe this upon seeing. Tearing ourselves away from this great spectacle, we quickly passed through the lively little town of Mason City, and headed south along that ancient channel of the Columbia, the Grand Coulee.

During the Pleistocene ice age, the normal channel of the Columbia river was choked with ice, and the great river turned aside to grind out the Grand Coulee from solid basalt rock. At the head of the Coulee is the dry falls over which once poured the entire Columbia. During the melting of the Pleistocene ice, more water poured over these falls than any other water falls ever known—it is stated to have been equivalent to more than 15 times the size and volume of our present Niagara Falls.

The old Coulee Falls were some 3 miles long, and some 700 feet high. Today there is a large lake at the foot of the dry falls. Pot holes, scoured out by huge rolling boulders, have been sounded in the lake, and are some 300 feet deep.

Many gem hunters make trips much longer than our 2,200 miles, but for sheer beauty, variety of scenery, and endless change of geological formations, and beautiful gem materials as the reward for hard hustling, it all adds up as the most interesting and profitable trip the writer has ever made. Such a field trip, taken the way we did, is a sure cure for ennui and city nostalgia.

### Amethyst Locality

One of the most noted amethyst producing areas in America is that of Jefferson county, Montana, to the east of Butte. For years this district has yielded not only choice quality groups of amethyst, but a considerable quantity of crystal quartz in large sizes and groups.

To reach the locality turn north from highway number ten, at milepost number 19. Drive five miles to the Homestake mining district. The best amethyst deposits are situated on the west fork of Rader creek. Commercial mining for amethyst has been carried on here for a number of years and very large specimen groups have been encountered. Gem quality crystals are also found.

The amethyst and quartz of Jefferson county is associated with a large dike, running in an east and west direction, outcropping at numerous places to the east of Butte. Amethyst and quartz are found on this dike, wherever gold mining operations are in progress. Much of the quartz and amethyst of Jefferson county is produced as a by-product of the mines. In the past the old mine dumps have yielded excellent specimens, but these are now harder to find, but the old mine workings still yield good material.

### Montana Onyx

A colorful, highly silicified claystone, locally termed Montana "onyx", is found in the Gravelly Range, south of Butte, Montana. The material is banded and colored in a pleasing manner, and owing to its high silicate content it is quite hard and takes an excellent polish. The material has been used as an ornamental stone and for gem cutting.

### More Montana Agate

Agates are found at localities other than the noted Yellowstone river region, but never in such great profusion. H. E. Murdock of Bozeman, describes here a number of the lesser regions.

Near Vaughn, west of Great Falls, is a region where evidently a volcanic eruption covered a forest which was later petrified and turned into black agate. There are some true casts in which the wood structure does not show except for the bark outline. Other specimens show a grain and annual ring structure but it is also mostly black agate. "Polkadot wood" is found occasionally in which a light blue agate has apparently filled in the wormholes while the other part is black or dark colored agate. To a limited extent fossil fernwood is also found in this region.

In the lower Madison Valley, along with the opalized woods, a little agatized wood is also found. There are different colors in this, mostly being light blue, pinks, gray, brown, or lavender and nearly always shows the year rings of the wood.

In the Gallatin range, east of Bozeman, is a deposit of agatized woods of many different colors. One stump of red, somewhat similar to the Arizona woods, was found, one of bright blue, one of light green and white and many sections of wood composed of black and white. The last named is the most characteristic color of this forest. Although there is considerable checking in these woods some nice polished specimens and sets can be obtained. In this region also were found a few rather small chalcedony nodules.

Forty miles north from Terry, along the highway to Circle, there are many petrified stumps but they are not agatized.

Out from White Sulphur Springs there is an outcropping of agate with moss, moss jasper, moss opal and other material that will take a high polish. This seems to have been formed through thermal action of some kind and has not been transported from some other region. The local people think it is a place where the Indians came to mine flint for their stone implements. The hillside and top have many craters that look as though excavation had been done but it is my belief at present that they were due to some thermal action — perhaps steam vents. At this point small meteorites also are to be found.

In the country adjoining the Horseshoe Hills in the northern part of Gallatin County, three somewhat similar outcroppings were visited, two of which will be mentioned here. At one locality light colored agate with black moss inclusions is available, while at the second locality reddish and pink colored material predominates.

# Wyoming

## The Jade State

Without doubt, the discovery of nephrite jade in Wyoming in May, 1936, rates as one of the most important gem finds made in the United States in more than 25 years. While exploring the hill in the sweetwater country, two prospectors, William Marion and Lloyd Curtis, both of Lander, brought out the first jade specimens to be recognized as such. Why this great amount of surface material remained unrecognized for so many years is a matter of some mystery. This original discovery way made near Split Rock, in the Southeastern part of Fremont County, and in the same general area where the well known pebbles of moss agate have been gathered by the millions for more than 75 years, and yet the jade remained unknown.

The second discovery of jade was about a year later by a sheepherder. This field is about 48 miles southwest of Lander. The sheepherder had plenty of time to sort over the many water worn "float" rocks on the surface, and recognized that some of the boulders were distinctly much heavier than similar size specimens. This aroused his curiosity and he brought a water worn mass of the jade into civilization.

Since then jade has been found (on the surface) at a great many localities, and over a wide territory, all centering around Lander. Practically all specimens found are distinctly rounded and smooth, indicating they have been water borne for some dissance. Jade has been found in situ at, at least one place in the Lander region. Since the original discovery, thousands and thousands of jade hunters have searched the great open areas around Lander, to a point where not much loose surface material remains to be found by the casual visitor. However, it is quite probable that the Lander region will continue to produce fine jade for many years to come. Each year water wash and natural errosion will bring additional material to light, to be found by the fortunate hunter who appears at the spot first. Moreover, there are certain low areas, and "pockets" at the foot of hills and gullies, where jade may be found by digging. Some of these pocket areas are likely to be productive of a quantity of fine material.

Jade, generally in smaller masses, is also found in lesser amounts on the great Red Desert, far south of Lander. Practically all of the jade region is situated high up on the denuded backbone of the Rocky Mountains, and nearly all of this ground is a part of the Public Domaine, unfenced, and unsettled, and where there are no restrictions on gem hunting. At this high elevation (mainly 6,000 to over 7,000 feet), July and August are the safest months for the stranger to enter. At any other time a sudden blizzard may trap the hunter not familiar with this country.

Some of the largest masses of gem jade ever found have been taken out of the Lander Jade Field. Specimens weighing from 50 to 300 pounds have been regarded as more or less common. Some masses have been brought in by truck, weighing around 4,000 pounds. Allan Branham, one of the pioneer jade hunters of Lander, found a fine water worn mass of jade weighing some 2,750 pounds. His huge mass may be seen on permanent exhibit in the Chicago Museum of Natural History. Many other huge masses were also recovered in the early days by gem hunter Branham. He was also the first to discover the opaque black jade, and the first to place it on the market. At the outset this superb material was sold for only about 50 cents a pound in the rough — it is worth far more, and in the markets of the Orient it frequently brings upwards of $50.00 a pound. The Occident does not value this material nearly as highly.

Jade is found in many colors in the Lander field, including many shades of green. The finest and most translucent green generally brings from about $10.00 to $25.00 per pound in the rough — far less than it would bring in the Orient. Likely the future will see a steady increase in the price of Wyoming jade.

All the jade found in the Lander field is by no means well suited for cabochon cutting — only the fine greens and the totally opaque black. All the inferior material is well suited for massive items, like book ends, and also for carving work. Great quantities of this inferior material have been shipped to China, where it is reduced into superb and valuable ornamental objects.

Practically all the jade found in the Lander field is dull and drab appearing, and it is difficult, if not impossible to determine by external inspection, just what quality it may be. Even the standard practice of chipping off a corner is wholly unreliable, for we often find a quite thick, and worthless weathered layer on the exterior, while in the interior there is likely to be a huge "core" of valuable gem material. Hence in evaluating a larger mass, sawing is generally indicated, as it is often next to impossible to break open a large mass by ordinary man power, sledge hammers included.

One of the characteristics of Wyoming jade is the invariable presence of a tinge of yellow. This is quite pronounced in some specimens, which are distinctly yellowish-green, but the yellow cast is present in every green specimen to some extent, even in the finest quality green. This may not be apparent to the inexperienced eye, but it is quickly noted when slabs of similar thickness are compared with the green jadeite of Burma, or the nephrite jade of New Zealand, and Monterey County, California. This very slight yellowish cast does not materially detract from the quality of the Wyoming jade, but it is a means by which Wyoming jade (the green) can be definitely identified as to locality.

The best way to determine and judge the quality of Wyoming jade, is to study the sawed slab by holding toward a strong light. Jade for cabochon purposes is generally sawed much thinner than material like agate. Jade is not regarded as a hard mineral as gems go, but due to the minute fibrous structure of all jade, it may be sawed or cut quite thin with practically no chance of fracturing, by ordinary rough handling or wear. This toughness of jade has often been associated with hardness, but jade is less hard than common agate.

## Sweetwater Agate

The widely known moss agate of Sweetwater County, Wyoming, was first known some 75 years ago, but dropped into obscurity for many years. About 15 years ago, Rev. O. P. Avery, then a resident of Rock Springs, Wyoming (now residing in Los Angeles), was the first to describe this notable locality, in the pages of *The Mineralogist Magazine*. This fine quality agate is uraniferous, and most specimens show the distinct yellowish-green fluorescence of uranium, under short wave ultraviolet light. This material is described in detail in the recent book, *Fluorescent Gems and Minerals* by De Ment. The original locality description by Rev. Avery is given here.

While "moss" agates are found in many parts of the world the Wyoming specimens are unique in that they are not only highly suitable for cutting and polishing into beautiful cabochon gems, but nearly half of the specimens will show a distinct green fluorescence under the little Argon bulb. Under the more powerful sources of ultra violet light many specimens give a most beautiful reaction.

Most of the specimens found at the locality are not large, seldom over two inches in size, and showing water wear. They are however, especially suited for cabochon cutting since no sawing is required. In one afternoon the writer and party readily picked up over 200 of these fine examples of moss agate.

To reach the locality, which has been given the name of Sweetwater Moss Agate Field, take highway No. 87 from Rawlins to Casper, branch west at Muddy Gap (also called Three Forks). Eleven miles west of here is Split Rock, a little cabin a few hundred yards north of the highway. Here definite information should be obtained on how to identify the turn-off from the main highway, some six miles further west. Or inquiry can be made at any ranch house on highway. Having found the turn-off, head north toward a small range of rough "Granite Mountains." Follow road to Sweetwater river and thence to Jammerman's ranch, a total of ten miles from main highway No. 87.

At Jammerman's ranch pass over bridge and follow road due north for four miles, then past a little cabin on left of road and then turn right past the remains of an old corral. Then turn north again to a little ranch, through a gate and continue north, the road will take you past a detached hill, around its east end and lead in a northerly direction, through a few gates, to a little clay butte, the locality for the moss agates. The locality is readily accessible by auto during dry weather, but it is well for those not familiar with travel in the west to make frequent local inquiry, when in doubt, as to the directions.

### Wyoming Agate

Agate and its brother chal-cedony are found at many localities in Wyoming. Much of this material will be found to fluoresce strongly—the familiar yellowish-green, characteristic of uranium. Attention may be called to the fact that it is well known that all the "country" rocks of Wyoming are abnormally high in (uranium) radioactivity. This likely accounts for the fact that the percolating ground waters, which originally deposited the agate, chalcedony, and silicified the woods, picked up uranium on its passage through these country rocks.

R. I. Martin, well known gem hunter of Saratoga, gives us below a description of some of the notable Agate and chalcedony regions in the state.

Quartz minerals including agates, chalcedony, jasper, crystal quartz and similar materials are found throughout most of southern Wyoming. Carbon County, in the southern part of the state an area of considerable extent, has its full quota of this mineral and at many localities good specimens occur in profusion.

To describe all the agate occurrences of Carbon county would be a task, indeed, for the County embraces a very large territory. The entire states of Connecticut and Delaware could be set down within its borders and there would still remain almost enough unoccupied surface to include Rhode Island. A detailed knowledge of all the quartz mineral localities of Carbon county would entail more travelling than any one person could hope to undertake in the course of occasional pleasure jaunts into the field. Hence the writer will confine his observations to a comparatively few areas within this most interesting territory.

Beginning near home, there are square miles of rolling prairie land, or "flats" as they are locally designated, lying north of Saratoga, between that town and the Union Pacific main line railroad tracks, which are literally strewn with small sections of agatized and opalized woods. These specimens range in size from small up to specimens weighing a pound or more. These "flats" are far from any timber, and represent sediments of various kinds and ages. Oil well drillings in the vicinity bring up marine fossil shells indicating the area was once the bottom of an inland sea.

Hardly any two pieces of this agatized material found are exactly alike in markings and other minor features, but practically all specimens are semi-transparent, with attractive areas of black bands, lines, "moss" (pyrolusite) and similar varieties.

The woods found here appear to be casts rather than direct replacements, for the internal wood structure is wholly lacking; only on the outer side of the specimens will markings of wood be found. Tests made of much of this material prove that practically all the specimens show a good green fluorescence under ultra violet light, the reaction varying in intensity with different lamps. A great deal of this widely diversified material is highly suited for gem stone cutting and for general ornamental purposes. Often a small fragment after being cut into a cabochon will show even better fluorescence, due perhaps to the fact that cutting removes some outer material that may have been slightly altered or "oxidized" from exposure.

The quantity available to the collector is limited only by his energy and carrying capacity. All available pocket space can be filled in a few minutes with material lying around loose on the surface. The more ambitious collector will likely load himself down in a few hours of search.

The deposits of the "flats" are not at all uniform but are scattered in an erratic fashion. Some hills and low places will be literally covered, while adjacent hills are virtually barren. Occasionally a low area between two hills will act as a catch basin with enormous accumulations, a real Mecca for any collector. The loose specimens "work to the surface," aided by wind and rain. One may search an area for choice pieces and then return in a few days, after a band of sheep or herd of cattle or horses have passed over the area and find many more. Even this slight disturbance of the surface will expose additional material. Much of it can be found within a few hundred yards of the paved highway leading toward Saratoga from the Lincoln Highway junction.

Some fifty miles to the south and west of the "flats" around Saratoga, the writer has found numerous and beautiful specimens of another type of agatized wood. This material is opaque, but excellent in color, occurring in alternate layers of red, green brown and yellow. None of this material has been tested for fluorescence so far as the writer can learn, neither has any detailed study been made to determine the species of the woods. In all probability the woods of this area are tropical or subtropical for, associated with the woods are found deposits of coal and similar materials to indicate at least a warm climate. This silicified wood shows no fracturing, is uniformly hard, displays remarkable colors and well suited for lapidary purposes.

In this same area are found silicious (agatized and calcareous fossil remains of various kinds including shells of seemingly many varieties. Unfortunately the writer is not qualified to give the reader a scientific description of this material. But suffice it is to say that much of this fossil material and the matrix in which it occurs shows a very pleasing fluorescence. A few specimens distributed by the writer have been tested for the phenomenon by various friends. Many of the shells are reported to fluoresce a beautiful red color by some types of lamps. These are doubtless the calcareous shells for calcite from some localities is known to fluoresce a strong red color. In any event this area should prove very interesting for the mineral collector as well as the geologist and those interested in paleontology.

Recently the writer visited another area about 100 miles north and east of Saratoga. Although the hills in this region are not high or precipitous, there appears to have been considerable volcanic activity at one time in the remote past. One hill in particular, where most of our time was spent, has the appearance of an old volcanic neck or cone. Its summit has an elevation of about 300 feet above the surrounding country, and it probably occupies a total area of about fifty acres. The slopes of this old volcanic cone (?) and the surrounding flat country are literally covered with fragments of agates, jaspers, and many similar materials, which have all the appearance of having been spewed out of the central cone. However, this quartz material most probably represents vein material long since eroded from its original matrix.

At the extreme summit of the hill is found what appears to be the vent or throat, of this miniature volcano, and in the "plug" is found an attractive light colored quartz. This material is found massive, crystalline and crystallized. Specimen hunters and those desiring this material for ornamental fireplaces, rock gardens and what not, have blasted and dug their way down into this "throat" for a distance of several feet, and hauled away many truckloads of material. Specimens are still available in quantity, and there are tons of rejected material lying about the shaft. Many tons of fragmentary pieces of banded agate and jasper and chert are also available for the discriminating collector to select from. In short this hill is a locality where no one will leave disappointed and where the very quantity of material will cause the collector to become "choosey."

Nearby and in sight of the above hill, is a similar hill having material of the same character, and with large sections of the "white agate" outcropping at the summit. This deposit has not been excavated. Similar hills in the vicinity were not investigated by the writer but appear worthy of a visit. Enroute home several stops were made at "flats" two miles from the first hill described and here the ground was found covered with various varieties of massive but colorful quartz minerals. Areas only about a hundred feet in diameter were searched, and yielding all we could comfortably carry we did not search further, but the deposit was much more extensive.

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